



IMPERIAL AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

EXPERIMENT STATION RECORD

JANUARY-JUNE 1943

IARI



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1944

UNITED STATES DEPARTMENT OF AGRICULTURE

SECRETARY—Claude R. Wickard

AGRICULTURAL RESEARCH ADMINISTRATION

ADMINISTRATOR—E. C. Auchter

OFFICE OF EXPERIMENT STATIONS

CHIEF—James T. Jardine

ASSISTANT CHIEF—R. W. Trullinger

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA— <i>Auburn</i> : M. J. Funchess. ¹	NEBRASKA— <i>Lincoln</i> : W. W. Burr. ¹
ALASKA— <i>College</i> : L. T. Oldroyd. ¹	NEVADA— <i>Reno</i> : S. B. Doten. ¹
ARIZONA— <i>Tucson</i> : P. S. Burgess. ¹	NEW HAMPSHIRE— <i>Durham</i> : M. G. Eastman. ¹
ARKANSAS— <i>Fayetteville</i> : C. O. Brannen. ¹	NEW JERSEY— <i>New Brunswick</i> : W. H. Martin. ¹
CALIFORNIA— <i>Berkeley</i> : C. B. Hutchison. ¹	NEW MEXICO— <i>State College</i> : Fabian Garcia. ¹
COLORADO— <i>Fort Collins</i> : H. J. Henney. ¹	NEW YORK—
CONNECTICUT—	State Station: <i>Geneva</i> : A. J. Heinicke. ¹
[New Haven] Station: <i>New Haven</i> : W. L. Slate. ¹	Cornell Station: <i>Ithaca</i> : C. E. F. Guterman. ¹
Storrs Station: <i>Storrs</i> : E. G. Woodward. ¹	NORTH CAROLINA— <i>State College Station, Raleigh</i> : L. D. Bayer. ¹
DELAWARE— <i>Newark</i> : G. L. Schuster. ¹	NORTH DAKOTA— <i>State College Station, Fargo</i> : H. I. Walster. ¹
FLORIDA— <i>Gainesville</i> : H. Mowry. ¹	OHIO— <i>Wooster</i> : Edmund Secrest. ¹
GEORGIA—	OKLAHOMA— <i>Stillwater</i> : W. L. Blizzard. ¹
Experiment: <i>H. P. Stuckey</i> . ¹	OREGON— <i>Corvallis</i> : W. A. Schoenfeld. ¹
Coastal Plain Station: <i>Tifton</i> : G. H. King. ¹	PENNSYLVANIA— <i>State College</i> : F. F. Lininger. ¹
HAWAII— <i>Honolulu</i> : J. H. Beaumont. ¹	PUERTO RICO—
IDAHO— <i>Moscow</i> : E. J. Iddings. ¹	Federal Station: <i>Mayaguez</i> : K. A. Bartlett. ¹
ILLINOIS— <i>Urbana</i> : H. P. Rusk. ¹	Insular Station: <i>Rio Piedras</i> : Arturo Roque. ¹
INDIANA— <i>La Fayette</i> : H. J. Reed. ¹	RHODE ISLAND— <i>Kingston</i> : M. H. Campbell. ¹
IOWA— <i>Ames</i> : R. E. Buchanan. ¹	SOUTH CAROLINA— <i>Clemson</i> : H. P. Cooper. ¹
KANSAS— <i>Manhattan</i> : L. E. Cail. ¹	SOUTH DAKOTA— <i>Brookings</i> : I. B. Johnson. ¹
KENTUCKY— <i>Lexington</i> : T. P. Cooper. ¹	TENNESSEE— <i>Knoxville</i> : C. A. Mooers. ¹
LOUISIANA— <i>University Station, Baton Rouge</i> : W. G. Taggart. ¹	TEXAS— <i>College Station</i> : A. B. Conner. ¹
MAINE— <i>Orono</i> : F. Griffee. ¹	UTAH— <i>Logan</i> : R. H. Walker. ¹
MARYLAND— <i>College Park</i> : W. B. Kemp. ¹	VERMONT— <i>Burlington</i> : J. E. Carrigan. ¹
MASSACHUSETTS— <i>Amherst</i> : F. J. Slevers. ¹	VIRGINIA—
MICHIGAN— <i>East Lansing</i> : V. R. Gardner. ¹	<i>Blacksburg</i> : A. W. Drinkard, Jr. ¹
MINNESOTA— <i>University Farm, St. Paul</i> : C. H. Bailey. ¹	Truck Station: <i>Norfolk</i> : H. H. Zimmerley. ¹
MISSISSIPPI— <i>State College</i> : C. Dorman. ¹	WASHINGTON—
MISSOURI—	College Station: <i>Pullman</i> : E. C. Johnson. ¹
College Station: <i>Columbia</i> : M. F. Miller. ¹	Western Station: <i>Puyallup</i> : J. W. Kalkus. ¹
Fruit Station: <i>Mountain Grove</i> : P. H. Shepard. ¹	WEST VIRGINIA— <i>Morgantown</i> : C. R. Orton. ¹
Poultry Station: <i>Mountain Grove</i> : T. W. Nolan. ¹	WISCONSIN— <i>Madison</i> : E. B. Fred. ¹
MONTANA— <i>Bozeman</i> : C. McKee. ¹	WYOMING— <i>Laramie</i> : J. A. Hill. ¹

¹ Director.

² Acting Director.

³ Superintendent.

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
 Agricultural Meteorology—F. V. RAND.
 Soils and Fertilizers—H. C. KNOBLAUCH, H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS, F. V. RAND.
 Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology—W. A. HOOKER, F. ANDRE.
 Animal Husbandry, Dairying and Dairy Farming—G. HAINES.
 Veterinary Medicine—W. A. HOOKER.
 Agricultural Engineering—H. C. WATERMAN.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition, Home Management and Equipment—SYBIL L. SMITH, GEORGIAN ADAMS.
 Textiles and Clothing—GEORGIAN ADAMS, H. M. STEECE.
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORAL FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 88

EDITORIALS

	Page
The fifty-sixth convention of the Association of Land-Grant Colleges and Universities.....	1
Research at the 1942 convention of the Association of Land-Grant Colleges and Universities.....	145

STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION :	Page	ARKANSAS STATION :	Page
Bulletin 256.....	113	Bulletin 417 (Annual Report 1941).....	15, 40, 46, 59, 72, 83, 96, 100, 106, 114, 126, 142
Bulletin 257.....	114	Bulletin 419.....	115
Circular 86.....	768	Bulletin 420.....	10
ALASKA UNIVERSITY STATIONS :		Bulletin 421.....	53
Progress Report 1938-41.....	594, 617, 630, 652, 665, 719	Bulletin 422.....	261
ARIZONA STATION :		Bulletin 423.....	270
Bulletin 185.....	668	Bulletin 424.....	268
Bulletin 186.....	541	Bulletin 425.....	284
Technical Bulletin 94.....	20	Bulletin 426.....	659
Technical Bulletin 95.....	445	Bulletin 427.....	661
Technical Bulletin 96.....	451	Bulletin 428 (Annual Report 1942).....	737, 755, 762, 768, 783, 797, 833, 841, 845, 867
Technical Bulletin 97.....	635		

CALIFORNIA STATION :		Page	FLORIDA STATION :		Page
Bulletin 593 (rev.)	-----	526	Bulletin 367	-----	119
Bulletin 668	-----	328	Bulletin 372	-----	87
Bulletin 669	-----	328	Bulletin 373	-----	232
Bulletin 671	-----	788	Bulletin 374	-----	250
Bulletin 674	-----	824	Bulletin 375	-----	329
Bulletin 675	-----	750	Bulletin 376	-----	526
Circular 276 (rev.)	-----	409	Bulletin 377	-----	836
Circular 352	-----	49	GEORGIA STATION :		
Hilgardia, vol. 14—			Bulletin 221	-----	836
No. 8, June 1942	-----	69, 70	Bulletin 222	-----	760
No. 9, Aug. 1942	-----	492, 494, 495	Bulletin 223	-----	739
No. 10, Sept. 1942	-----	778, 779	Circular 139	-----	538
Forecast of Changes in California Agricultural Production in 1943	-----	836	Annual Report 1942	-----	579,
Mimeographed Report 81	-----	112	594, 611, 617, 627, 640, 654, 666,		
			671, 682, 693, 699, 700, 719.		
COLORADO STATION :			GEORGIA COASTAL PLAIN STATION :		
Bulletin 473	-----	698	Bulletin 27	-----	473
Technical Bulletin 29	-----	829	Bulletin 32 (Annual Report 1941)	-----	299, 325,
Colorado Farm Bulletin—			331, 344, 362, 372, 380,		426
Vol. 4, No. 4, Oct.-Dec. 1942	-----	757, 763, 768, 849, 867	Bulletin 33	-----	188
Vol. 5, No. 1, Jan.-Mar. 1943	-----	738,	Bulletin 34	-----	188
756, 761, 765, 776, 834, 844			Circular 8	-----	232
Snow Surveys and Irrigation Water Forecasts for the—			HAWAII STATION :		
Missouri and Arkansas Drainage Basins, Feb. 1, 1943	-----	736	Bulletin 88	-----	277
Colorado River Drainage Basin, Feb. 1, 1943	-----	736	IDAHO STATION :		
Rio Grande Drainage Basin, Feb. 1, 1943	-----	736	Bulletin 242	-----	224
CONNECTICUT [NEW HAVEN] STATION :			Bulletin 246	-----	493
Bulletin 459	-----	373	Bulletin 247	-----	333
Bulletin 460	-----	127	Circular 86	-----	250
Bulletin 461	-----	409	ILLINOIS STATION :		
Bulletin 462	-----	507	Bulletin 490	-----	16
Bulletin 463	-----	535	Bulletin 491	-----	401
Bulletin 464	-----	768	Bulletin 492	-----	403
[CONNECTICUT] STORRS STATION :			Bulletin 493	-----	338
Bulletin 240	-----	819	Bulletin 494	-----	475
Bulletin 241	-----	841	RSM-10	-----	542
Bulletin 242	-----	758	INDIANA STATION :		
DELAWARE STATION :			Bulletin 468	-----	737
Bulletin 237	-----	265	Bulletin 469	-----	841
			Bulletin 470	-----	799
			Bulletin 471	-----	776
			Bulletin 472	-----	848
			Bulletin 473	-----	837
			Bulletin 474	-----	766
			Bulletin 475	-----	838
			Circular 270	-----	476
			Circular 271	-----	692
			Circular 272	-----	800
			Circular 273	-----	798

INDIANA STATION—Continued.		Page	KENTUCKY STATION—Continued.		Page
Circular 274.....		809	Bulletin 431.....		842
Circular 275.....		739	Bulletin 432.....		539
Circular 276.....		762	Bulletin 433.....		841
Circular 277.....		763	Circular 53.....		833
IOWA STATION :			Circular 54.....		817
Research Bulletin 298.....		111	Regulatory Series Bulletin		
Research Bulletin 300.....		120	31.....		373
Research Bulletin 303.....		124	Regulatory Series Bulletin		
Research Bulletin 304.....		111	32.....		332
Research Bulletin 305.....		809	Regulatory Series Bulletin		
Research Bulletin 306.....		698	33.....		330
Research Bulletin 307.....		694	LOUISIANA STATION :		
Research Bulletin 308.....		693	Bulletin 345.....		121
Research Bulletin 309.....		694	Bulletin 347.....		122
Bulletin P28, new series.....		845	Bulletin 350.....		362
Bulletin P29, new series.....		125	Bulletin 351.....		122
Bulletin P48, new series.....		608	Bulletin 352.....		341
Bulletin P49, new series.....		622	Bulletin 353.....		397
Soil Survey Report 80.....		15	Bulletin 354.....		352
Soil Survey Report 81.....		15	Bulletin 355.....		700
Soil Survey Report 82.....		15	MAINE STATION :		
KANSAS STATION :			Bulletin 412.....		398
Bulletin 300.....		140	Bulletin 413.....		398
Bulletin 301.....		194	Official Inspections 183.....		545
Bulletin 303.....		399	Official Inspections 184.....		667
Bulletin 304.....		329	Official Inspections 185.....		599
Bulletin 305.....		397	MASSACHUSETTS STATION :		
Bulletin 306.....		330	Bulletin 393.....		49
Bulletin 307.....		325	Bulletin 394.....		65
Bulletin 308.....		838	Bulletin 395.....		165
Bulletin 309.....		696	Bulletin 396.....		468
Bulletin 310.....		623	Control Series Bulletin 112.....		249
Technical Bulletin 52.....		320	Control Series Bulletin 113.....		798
Technical Bulletin 53.....		633	Control Series Bulletin 114.....		739
Circular 211.....		867	Meteorological Series Bulletin		
Circular 212.....		389	637-648, Jan.-Dec.		
Circular 213.....		399	1942.....		594
Circular 214.....		678	MICHIGAN STATION :		
Agricultural Economics—			Special Bulletin 318.....		125
Report 14.....		537	Special Bulletin 319.....		271
Report 15.....		537	Special Bulletin 320.....		691
Report 16.....		539	Quarterly Bulletin, vol. 25—		
Biennial Report 1941-42.....		579,	No. 1, Aug. 1942.....		199,
595, 603, 612, 618, 627, 640, 655,			233, 235, 237, 238, 239, 248,		
666, 671, 676, 688, 693, 697, 701,			264, 267, 269, 271.		
719.			No. 2, Nov. 1942.....		596, 630,
KENTUCKY STATION :			633, 637, 656, 667, 668, 669,		
Bulletin 427.....		540	670, 675, 683, 690, 692, 695.		
Bulletin 428.....		537	No. 3, Feb. 1943.....		737, 755,
Bulletin 429.....		838	764, 765, 766, 776, 777, 784,		
Bulletin 430.....		765	797, 800, 808, 827, 839, 850		

MINNESOTA STATION :		Page	MISSOURI STATION—Continued.		Page
Bulletin 306 (rev.)	-----	799	Circular 244	-----	757
Bulletin 336 (rev.)	-----	184	The Physical Status and		
Bulletin 361	-----	380	Health of Farm Security		
Technical Bulletin 151	-----	181	Clients in Southeast Mis-		
Technical Bulletin 152	-----	522	souri.—Preliminary Report		
Technical Bulletin 153	-----	549	1	-----	405
Technical Bulletin 154	-----	489	The Physical Status and		
Technical Bulletin 156	-----	431	Health of Farm Tenants		
MISSISSIPPI STATION :			and Farm Laborers in		
Bulletin 369	-----	342	Southeast Missouri.—Pre-		
Bulletin 370	-----	670	liminary Report 2	-----	405
Bulletin 371	-----	798	The Physical Status and		
Technical Bulletin 30	-----	424	Health of Farm Tenants		
Circular 107	-----	332	and Farm Laborers in		
Circular 108	-----	253	Southeast Missouri.—Pre-		
Mississippi Farm Research—			liminary Report 3	-----	406
Vol. 5—			MONTANA STATION :		
No. 8, Aug. 1942	-----	41,	Bulletin 404	-----	399
49, 52, 63, 85, 86, 92,		142	Bulletin 405	-----	333
No. 9, Sept. 1942	-----	154,	Bulletin 407	-----	667
159, 186, 191, 203, 230,		238,	Bulletin 408	-----	655
253, 269, 275.			Circular 167	-----	527
No. 10, Oct. 1942	-----	300, 325,	Circular 168	-----	545
331, 342, 354, 369, 409,		424	[Biennial] Report 1941–42	-----	596,
No. 11, Nov. 1942	-----	453,	618, 628, 640, 652, 666, 671, 676,		
454, 476, 479, 536, 544			688, 720.		
No. 12, Dec. 1942	-----	597,	NEBRASKA STATION :		
598, 599, 618, 629, 718			Bulletin 343	-----	521
Vol. 6, No. 1, Jan. 1943	-----	736,	Bulletin 344	-----	379
738, 739, 755, 786, 801, 838			Research Bulletin 128	-----	103
MISSOURI STATION :			Research Bulletin 130	-----	242
Bulletin 441 (Annual Report			Circular 69	-----	475
1939)	-----	5, 15,	Circular 70	-----	287
25, 34, 41, 46, 59, 72, 84, 92, 99,			Circular 71	-----	408
105, 110, 124, 127, 134, 142.			Annual Report [1941]	-----	5, 15,
Bulletin 448	-----	113	41, 47, 59, 73, 84, 95, 99, 105, 142		
Bulletin 450	-----	339	NEVADA STATION :		
Bulletin 451	-----	380	Bulletin 162	-----	233
Bulletin 452	-----	573	Farm Management Bulletin,		
Bulletin 453	-----	514	vol. 3—		
Bulletin 454	-----	483	No. 2, Aug. 1942	-----	538
Bulletin 455	-----	767	No. 3, Nov. 1942	-----	539
Research Bulletin 346	-----	112	No. 4, Nov. 1942	-----	718
Research Bulletin 347	-----	322	No. 5, Dec. 1942	-----	538
Research Bulletin 348	-----	335	NEW HAMPSHIRE STATION :		
Research Bulletin 349	-----	320	Bulletin 337	-----	263
Research Bulletin 350	-----	320	Bulletin 338	-----	285
Circular 240	-----	835	Bulletin 339	-----	400
Circular 241	-----	332	Bulletin 340	-----	589
Circular 242	-----	454	Bulletin 341	-----	476
Circular 243	-----	374			

NEW HAMPSHIRE STATION—Con.	Page	[NEW YORK] CORNELL STATION—	Page
Bulletin 342.....	373	Continued.	
Bulletin 343.....	454	Bulletin 785.....	358
Technical Bulletin 79.....	220	Memoir 245.....	192
Circular 58.....	188	Memoir 246.....	207
Circular 61.....	187	Memoir 247.....	498
Circular 62.....	231	Mimeographed Bulletin 6.....	543
NEW JERSEY STATIONS:		NEW YORK STATE STATION:	
Bulletin 686.....	750	Bulletin 702.....	79
Bulletin 687.....	180	Bulletin 703.....	785
Bulletin 689.....	738	Technical Bulletin 264.....	66
Bulletin 700.....	802	Technical Bulletin 265.....	521
Bulletin 702.....	842	Circular 93 (rev.).....	96
Bulletin 703.....	766	Circular 194.....	129
Circular 441.....	73	Circular 195.....	129
Circular 442.....	79	Circular 196.....	284
Circular 445.....	784	Farm Research—	
Circular 446.....	739	Vol. 8, No. 4, Oct. 1, 1942.....	157,
Circular 447.....	43	186, 191, 194, 196, 215, 227,	
Circular 448.....	187	274, 287.	
Circular 449.....	168	Vol. 9, No. 1, Jan. 1, 1943.....	728,
Circular 450.....	738	735, 762, 763, 764, 766, 767,	
Circular 451.....	168	771, 776, 785, 786, 801, 850.	
Circular 452.....	168	Better New York Hops, vol. 3,	
Hints to Poultrymen—		No. 4, Aug. 1942.....	332
Vol. 29—		Annual Report 1942.....	149,
No. 5, June–July 1942.....	88	159, 190, 191, 193, 200, 203, 218,	
No. 6, Aug.–Sept. 1942.....	806	278, 272, 287.	
Vol. 30, No. 1, Oct.–Nov.		NORTH CAROLINA STATION:	
1942.....	806	Bulletin 332.....	340
Nursery Disease Notes, vol.		Bulletin 333.....	342
15—		Bulletin 334.....	115
No. 1, July 1942.....	62	Bulletin 335.....	510
No. 2, Aug. 1942.....	213	Technical Bulletin 69.....	400
No. 4, Oct. 1942.....	358	Technical Bulletin 70.....	394
No. 5, Nov. 1942.....	646	Technical Bulletin 71.....	402
No. 6, Dec. 1942.....	651	Technical Bulletin 72.....	538
Plant Disease Notes, vol. 20—		Technical Bulletin 73.....	694
No. 5, Aug. 1942.....	491	Annual Report 1941.....	441,
No. 6, Sept. 1942.....	490	446, 468, 473, 476, 485, 514, 520,	
No. 7, Oct. 1942.....	490	532, 534, 537, 541, 574.	
NEW MEXICO STATION:		NORTH DAKOTA STATION:	
Bulletin 293.....	120	Circular 66.....	259
Bulletin 295.....	78	Bimonthly Bulletin, vol. 5—	
Bulletin 296.....	837	No. 1, Sept. 1942.....	298,
[NEW YORK] CORNELL STATION:		329, 330, 373, 393, 394	
Bulletin 780.....	399	No. 2, Nov. 1942.....	620,
Bulletin 781.....	262	623, 626, 659, 693, 720	
Bulletin 782.....	398	OHIO STATION:	
Bulletin 783.....	117	Bulletin 617 (Annual Report	
Bulletin 784.....	333	1939).....	296,
		300, 318, 326, 331, 342, 344, 362,	
		373, 380, 383, 392, 394, 409, 426	

OHIO STATION—Continued.		Page	PENNSYLVANIA STATION:		Page
Bulletin 631	-----	98	Bulletin 428	-----	127
Bulletin 632	-----	260	Bulletin 429 (Annual Report	-----	
Bulletin 633	-----	264	1942)	-----	583,
Bulletin 634	-----	341	595, 619, 628, 638, 641, 652, 666,		
Bulletin 635	-----	698	671, 676, 688, 696, 697, 700, 701,		
Bimonthly Bulletin 217	-----	46,	720.		
	50, 87, 110		Bulletin 430	-----	332
Bimonthly Bulletin 218	-----	370,	Bulletin 431	-----	334
	380, 394		Bulletin 432	-----	715
Bimonthly Bulletin 219	-----	516,	Bulletin 433	-----	540
	535, 537		Bulletin 434	-----	647
Special Circular 51 (rev.)	-----	235			
Special Circular 65	-----	50			
OKLAHOMA STATION:			PUERTO RICO STATION:		
Bulletin 259	-----	228	Report 1941	-----	597,
Bulletin 260	-----	193	619, 628, 649, 655, 692, 720		
Bulletin 261	-----	356			
Bulletin 262	-----	375	PUERTO RICO UNIVERSITY STA-		
Technical Bulletin 14	-----	190	TION:		
Technical Bulletin 15	-----	164	Mimeographed Report 20,		
Technical Bulletin 16	-----	661	Supplements 3-7	-----	696
Circular 105	-----	261	Agricultura Experimental,		
Circular 106	-----	194	vol. 2, No. 4, July-Aug.		
Current Farm Economics,			1942	-----	476
vol. 15—			Journal of Agriculture of the		
No. 5, Oct. 1942	-----	261	University of Puerto Rico,		
No. 6, Dec. 1942	-----	693	vol. 26—		
Biennial Report 1941-42,			No. 1, Jan. 1942	-----	83
part 1	-----	737,	No. 2, Apr. 1942	-----	198, 222, 223
755, 763, 769, 783, 797, 808,		867			
Biennial Report 1941-42,					
part 2	-----	867			
OREGON STATION:			RHODE ISLAND STATION:		
Bulletin 400	-----	121	Bulletin 281	-----	167
Bulletin 401 (Biennial Re-			Bulletin 282	-----	263
port 1939-40)	-----	579,	Miscellaneous Publication—		
595, 619, 628, 641, 652, 655,			10	-----	398
666, 676, 692, 720.			11	-----	403
Bulletin 406	-----	114	12	-----	328
Bulletin 409	-----	830	13	-----	701
Bulletin 410	-----	842	14	-----	694
Bulletin 411	-----	825	Feed Circular, June 1942	-----	667
Bulletin 412	-----	795	Annual Report 1941	-----	299,
Bulletin 413	-----	767	301, 326, 331, 344, 362, 379, 383,		
Circular 144	-----	825	394, 405, 409, 425, 426.		
Circular 145	-----	834			
Circular of Information 277	-----	528			
Snow Surveys and Irrigation			SOUTH CAROLINA STATION:		
Water Forecasts for Ore-			Bulletin 342	-----	404
gon as of Feb. 1 and Mar.			Bulletin 343	-----	548
1, 1943	-----	736	Bulletin 344	-----	402
			Circular 62	-----	565
			Circular 63	-----	885
			SOUTH DAKOTA STATION:		
			Bulletin 361	-----	186
			Bulletin 362	-----	268
			Bulletin 363	-----	269

TENNESSEE STATION :		Page	VERMONT STATION—Continued.		Page
Bulletin 181.....		44	Bulletin 495 (Annual Report 1942).....		447,
Bulletin 182.....		785	467, 476, 483, 485, 506, 520,		
Circular 78.....		238	534, 574.		
Circular 81.....		635	Bulletin 496.....		454
Circular 82.....		784	Bulletin 497.....		330
Circular 83.....		772	Bulletin 498.....		381
Agricultural Economics and Rural Sociology Department—			VIRGINIA STATION :		
Monograph 136.....		120	Bulletin 340.....		124
Monograph 137.....		120	Bulletin 341.....		114
Monograph 138.....		124	Bulletin 342.....		506
Monograph 139.....		262	Technical Bulletin 80.....		327
Monograph 140.....		267	Technical Bulletin 81.....		520
Monograph 141.....		330	Rural Sociology Report 20.....		276
Monograph 142.....		403	Rural Sociology Report 22.....		276
Monograph 143.....		841	VIRGINIA TRUCK STATION :		
Monograph 144.....		844	Bulletin 107.....		332
			Bulletin 108.....		488
TEXAS STATION :			WASHINGTON STATION :		
Bulletin 613.....		86	Bulletin 414.....		262
Bulletin 614.....		208	Bulletin 415.....		268
Bulletin 615.....		199	Bulletin 416.....		236
Bulletin 616.....		328	Bulletin 417.....		503
Bulletin 619.....		599	Bulletin 418.....		517
Circular 97.....		373	Bulletin 419.....		541
Annual Report 1941.....		15,	Bulletin 420.....		542
21, 25, 35, 42, 47, 59, 73, 84,			Bulletin 421.....		767
92, 99, 105, 110, 127, 140, 142			Bulletin 422.....		847
			Bulletin 423.....		695
UTAH STATION :			WEST VIRGINIA STATION :		
Bulletin 302.....		516	Bulletin 305.....		395
Bulletin 304.....		455	Bulletin 306.....		756
Farm and Home Science, vol. 3—			Circular WS-1.....		473
No. 3, Sept. 1942.....		186,	Circular WS-2.....		473
187, 191, 233, 235, 257			Circular WS-3.....		473
No. 4, Dec. 1942.....		595,	Circular WS-4.....		473
619, 634, 647, 653, 667,			Circular WS-5.....		441
668, 670, 673, 692, 720.			Circular WS-6.....		534
			Circular WS-7.....		129
			Circular WS-9.....		473
VERMONT STATION :			WISCONSIN STATION :		
Bulletin 487.....		85	Special Bulletin (rev. June 1942), Coccidiosis in Chickens.....		248
Bulletin 488.....		31			
Bulletin 489.....		56	WYOMING STATION :		
Bulletin 490.....		141	Bulletin 254.....		181
Bulletin 491.....		118	Bulletin 255.....		245
Bulletin 492.....		33	Bulletin 256.....		373
Bulletin 493.....		52			

**UNITED STATES DEPARTMENT OF AGRICULTURE
PUBLICATIONS ABSTRACTED**

	Page	Statistical Bulletin—Continued.	Page
Bulletin 1360 (rev.)-----	403	75-----	58
Technical Bulletin—		76-----	58
809-----	500	77-----	695
815-----	116	Circular—	
816-----	505	108 (rev.)-----	269
820-----	45	249 (rev.)-----	403
822-----	109	270 (rev.)-----	784
825-----	17	279 (rev.)-----	96
826-----	111	369 (rev.)-----	221
828-----	50	643-----	659
829-----	47	649-----	80
830-----	55	650-----	228
831-----	86	651-----	43
832-----	95	652-----	67
833-----	162	653-----	189
834-----	163	654-----	140
835-----	347	655-----	43
836-----	318	656-----	68
837-----	737	657-----	226
838-----	793	658-----	45
Farmers' Bulletin—		659-----	51
684 (rev.)-----	379	660-----	450
1474 (rev.)-----	296	661-----	638
1599 (rev.)-----	349	662-----	537
1663 (rev.)-----	43	663-----	794
1673 (rev.)-----	763	Leaflet—	
1758 (rev.)-----	186	223-----	188
1762 (rev.)-----	129	225-----	226
1769 (rev.)-----	238	226-----	368
1904-----	189	227-----	194
1906-----	73	228-----	528
1907-----	57	229-----	658
1909-----	396	230-----	718
1911-----	658	Miscellaneous Publication—	
1912-----	57	60 (rev.)-----	142
1913-----	756	300, Supplement-----	669
1914-----	390	336 (rev.)-----	81
1915-----	191	394 (rev.)-----	164
1916-----	374	401-----	189
1917-----	506	470-----	228
1918-----	130	477-----	201
1919-----	787	482-----	867
1921-----	620	483 (rev.)-----	763
1924-----	757	484-----	228
1925-----	718	485-----	261
1926-----	768	489-----	141
Statistical Bulletin—		491-----	532
73-----	57	492-----	111
74-----	123	493-----	128

Miscellaneous Publication—Con.	Page	BUREAU OF AGRICULTURAL ECONOMICS—Continued.	Page
494.....	24	F. M. 33.....	396
495.....	46	F. M. 34.....	396
496.....	261	F. M. 35.....	113
497.....	261	F. M. 36.....	399
500.....	663	L. E. Bulletin 69.....	840
502.....	544	Rural Life Studies No. 2.....	406
503.....	287	Rural Life Studies No. 3.....	271
504.....	827	Rural Life Studies No. 4.....	271
506.....	609	Interest Charges Payable on	
507.....	607	Farm Indebtedness in the	
Agricultural History Series—		United States, 1910-40.....	265
No. 3.....	400	Land Ownership and Operat-	
No. 4.....	402	ing Tenure in Imperial	
No. 5.....	839	Valley, California.....	840
Consumers' Counsel Series Publi-		Livestock Transportation and	
cation 7.....	401	Processing Problems in	
The Farmer and the War, Nos.		1942-43 and 1943-44.....	694
1-3.....	270	Migration and Settlement	
Foreign Agriculture Bulletin 1 ..	840	Pacific Coast Report 10.....	840
Hydrologic Bulletin 4.....	594	The Prevention of Accidents	
Inventory 131.....	308	on Farms and in Homes....	267
Crops and Markets, vol. 19—		Trucking Milk to Providence,	
No. 5, May 1942.....	124	Rhode Island.....	403
No. 6, July 1942.....	124	Report of the Chief, 1942.....	835
No. 7, Oct. 1942.....	540	AGRICULTURAL MARKETING SERV-	
Yearbook 1942.....	97	ICE:	
Backgrounds of the War Farm		F. M. 29.....	108
Labor Problem.....	541	F. M. 30.....	108
AGRICULTURAL ADJUSTMENT AD-		Quality Studies of Wheat	
MINISTRATION:		Varieties Grown in the	
D-1, D-1 (rev.), D-2, D-2		Western Region in 1941....	626
(rev.), D-3, [Farmers'		Report of the Administrator,	
Discussion Group Pam-		1942.....	841
phlets].....	543	BUREAU OF ANIMAL INDUSTRY:	
BUREAU OF AGRICULTURAL CHEMIS-		A. H. D. No. 52.....	800
TRY AND ENGINEERING:		Special Report on Diseases	
ACE-174.....	5	of Cattle (rev.).....	243
Report of the Chief, 1942.....	723, 827	Report of the Chief, 1942.....	611,
BUREAU OF AGRICULTURAL ECO-		665, 676, 700	
NOMICS:		COMMODITY CREDIT CORPORATION:	
D-4, [D-5], [Farmers' Dis-		Report of the President,	
cussion Group Pam-		1942.....	841
phlets].....	543	BUREAU OF DAIRY INDUSTRY:	
F. M. 28.....	45	Report of the Chief, 1942.....	670
F. M. 29.....	108	BUREAU OF ENTOMOLOGY AND	
F. M. 30.....	108	PLANT QUARANTINE:	
F. M. 31.....	396	Cumulative Index to Service	
F. M. 32.....	392	and Regulatory Announce-	
		ments Nos. 1 to 149, In-	
		clusive.....	736

EXTENSION SERVICE:	Page	FOREST SERVICE—Continued.	Page
D-1, D-1 (rev.), D-2, D-2 (rev.), D-3, [D-5], [Farmers' Discussion Group Pamphlets]-----	543	Southwestern Forest and Range Experiment Station Note 99-----	620
FARM CREDIT ADMINISTRATION:		Climatological Data for the Period 1911 to 1940, Inclusive, for the Wind River Weather Station, Skamania County, Washington-----	594
Bulletin 49-----	404	Lumber Requirements on the Farm-----	830
[Bulletin CR-1], Agricultural Credit in Germany-----	265	Pacific Northwest Forest and Range Experiment Station, Range Research Report—	
Bulletin CR-2, Agricultural Credit in Denmark-----	265	No. 1-----	327
Bulletin CR-3, Agricultural Credit in Canada-----	265	No. 2-----	326
Circular 126-----	122	No. 3-----	327
W. C. 1-----	404	Report of the Chief, 1942-----	768
Miscellaneous Report 54-----	268		
Miscellaneous Report 57-----	269		
Annual Report, 1941-----	264		
OFFICE OF FOREIGN AGRICULTURAL RELATIONS:		BUREAU OF HOME ECONOMICS:	
Agriculture in the Americas—		Report of the Chief, 1942-----	699, 716, 718, 719
Vol. 2—			
No. 8, Aug. 1942-----	123	LIBRARY:	
No. 10, Oct. 1942-----	341	Library List 3-----	111
No. 11, Nov. 1942-----	332		
No. 12, Dec. 1942-----	515	BUREAU OF PLANT INDUSTRY:	
Vol. 3, No. 1, Jan. 1943-----	768	[Soil Survey Report]—	
Foreign Agriculture—		Series 1935—	
Vol. 6—		No. 22-----	302
No. 6, June 1942-----	123, 130	No. 23-----	595
No. 7, July 1942-----	123	Series 1936—	
No. 8, Aug. 1942-----	123	No. 13-----	595
No. 9, Sept. 1942-----	123	No. 14-----	302
No. 10, Oct. 1942-----	405	No. 15-----	302
No. 11, Nov. 1942-----	540	No. 16-----	16
No. 12, Dec. 1942-----	515	No. 17-----	302
Vol. 7, No. 1, Jan. 1943-----	839	No. 18-----	160
Foreign Agriculture Report—		No. 19-----	302
No. 4-----	54	Series 1938—	
No. 5-----	123	No. 2-----	160
No. 6-----	55	Plant Disease Reporter—	
No. 7-----	405	Vol. 26—	
The International Wheat Agreement-----	405	No. 16, Sept. 1, 1942-----	58
		No. 17, Sept. 15, 1942-----	58
		No. 18, Oct. 1, 1942-----	202
		No. 19, Oct. 15, 1942-----	202
		No. 20, Nov. 1, 1942-----	343
		No. 21, Nov. 15, 1942-----	343
		No. 22, Dec. 1, 1942-----	640
		No. 23, Dec. 15, 1942-----	640
FOREST SERVICE:			
Caribbean Forester, vol. 1, No. 2, Jan. 1940-----	71		
Allegheny Forest Experiment Station Occasional Paper 5-----	650		

	Page	RURAL ELECTRIFICATION ADMINISTRATION :	Page
Bureau of Plant Industry—Con.		Report of the Administrator,	
Plant Disease Reporter—Con.		1942	830
Sup. 137, Aug. 15, 1942---	62		
Sup. 138.....	211	SOIL CONSERVATION SERVICE :	
Quality Characteristics of		SCS-MP-25	298
Hard Red Winter Wheat		SCS-MP-26	266
Varieties Grown in Co-		SCS-TP-30, Sup. 1.....	594
operative Plot and Nurs-		SCS-TP-42	158
ery Experiments in the		SCS-TP-46	736
Hard Red Winter Wheat		SCS-TP-47	736
Region in 1940.....	625	Physical Land Survey No. 25..	737
Quality Studies of Wheat		[Region 5], Biology Hand-	
Varieties Grown in the		book	497
Western Region in 1941---	626	Snow Surveys and Irrigation	
Third revision of the Inter-		Water Forecasts—	
national Register of Phys-		for the Colorado River	
iologic Races of the Leaf		Drainage Basin, Feb.	
Rust of Wheat (<i>Puccinia</i>		1, 1943.....	736
<i>rubigo-vera tritici</i> (<i>Triti-</i>		for the Missouri and	
<i>cina</i>))	207	Arkansas Drainage	
1939 Report of the Uniform		Basins, Feb. 1, 1943---	736
Alfalfa Nurseries	474	for the Rio Grande	
1940 Report of the Uniform		Drainage Basin, Feb.	
Alfalfa Nurseries.....	474	1, 1943.....	736
Report of the Chief, 1942---	594,	for Oregon as of Feb. 1	
616, 627, 640, 688		and Mar. 1, 1943.....	736

JOURNAL OF AGRICULTURAL RESEARCH

Vol. 65—	Page	Vol. 65--Continued.	Page
No. 3, Aug. 1, 1942.....	34, 71, 77	No. 10, Nov. 15, 1942---	468,
No. 4, Aug. 15, 1942----	18, 19, 60		480, 507, 508
No. 5, Sept. 1, 1942.....	182, 212	No. 11, Dec. 1, 1942.....	608, 678
No. 6, Sept. 15, 1942.....	164, 214	No. 12, Dec. 15, 1942---	608, 621, 645
No. 7, Oct. 1, 1942.....	289, 340, 356, 389	Vol. 66—	
No. 8, Oct. 15, 1942---	458, 465, 516	No. 1, Jan. 1, 1943.....	747,
No. 9, Nov. 1, 1942.....	466,		749, 772, 792
	467, 495, 515	No. 2, Jan. 15, 1943.....	738,
			761, 784, 786

EXPERIMENT STATION RECORD

VOL. 88

JANUARY 1943

No. 1

THE FIFTY-SIXTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The central theme of the 1942 convention of the Association of Land-Grant Colleges and Universities was the wartime responsibilities of these institutions—how they may aid and adjustments required. Not since the memorable session of 1917 had a convention been held under comparable circumstances, and inevitably these circumstances profoundly affected its location, its attendance, its program, and its reactions.

In a spirit of continued cooperation with efforts to avoid increasing congestion in the Nation's Capital, Chicago was selected as the place of meeting for the second consecutive year. The usual date was advanced in a readjustment due to a necessary shifting of hotels from the Stevens to the Drake following the preemption of the original quarters by the War Department. The general sessions took place from October 28 to 30, 1942, with preconvention assemblies of various constituent groups and committees scattered over the 5 days preceding.

On the whole the attendance was representative of the various institutions and interests, but for obvious reasons delegations tended to be curtailed to a minimum. Among those kept in Washington by the pressure of daily business was the Secretary of Agriculture, who had been scheduled to discuss the major significance and outstanding accomplishments of the Second Inter-American Conference of Agriculture (E. S. R., 87, p. 757). A brief message from him entitled Working Together for Victory was read by Dr. M. L. Wilson, Director of Extension Work. In this message Secretary Wickard pointed out that "the land-grant colleges and universities, which performed such notable services in the last war, are proving their ability to serve equally well in this one." He stated that "we in the Department are looking, as we always have looked, to the land-grant colleges and the Extension Service to help every farm family carry the wartime policies into action." "In fact," he added, "your group is the only one with the experience and the trained personnel for making the findings of research available to farm families."

The convention was opened with the address of the president of the association, President James D. Hoskins, of Tennessee, who took for his subject **A Unified Command and Democracy in Agriculture**. In this address the background of the acts establishing the land-grant institutions and the Department was reviewed. In his opinion "an identical philosophy of aid to agriculture inspired both acts and founded a national policy of cooperation between these two agencies, which has been maintained down the years." Acknowledging that "it is generally recognized that the exigencies of war require centralization of administration of certain powers and war programs to a degree unprecedented in peace," and that "our greatest task at the present time is to adjust our resident instruction, research, and extension activities toward winning this war," he nevertheless advocated "the restoration of the democratic relationship between the United States Department of Agriculture and the land-grant colleges and other departments and agencies of the Federal Government all along the line—as swiftly as possible in the post-war world." In conclusion he maintained that "in the democratic policy or pattern provided for in the Land-Grant College Act and the act creating the United States Department of Agriculture, and the cooperative relationship between them during the past 80 years, the land-grant colleges have made a great contribution to the development of the Nation's agriculture and industry. Their usefulness has continually increased. This relationship sets a pattern for all educational programs sponsored jointly by the Federal Government and the States. This relationship is essentially the democratic process in the development of educational programs for the masses of the people and is the basis of an enduring democracy and of democratic institutions."

As would be expected, much consideration was given by the convention and its constituent groups to the question of necessary immediate and post-war adjustments. Among the addresses scheduled for the general sessions were **The Utilization of the Facilities of the Land-Grant Colleges and Universities**, by President Edward C. Elliott of Purdue University; **Adjustments That Should Be Made in the Engineering Curricula for the War and Post-War Periods**, by Dr. W. E. Wickenden, president of the Case School of Applied Science; **Adjustments That Should Be Made in the Land-Grant Curricula Exclusive of Engineering**, by President W. C. Coffey of Minnesota; and **Agricultural Problems in the War and Post-War Periods**, by Dr. W. I. Myers, of Cornell University. Of these addresses, further mention may be made of that of President Coffey, in which he pointed out that "first, we must make haste slowly in shifting courses or in planning our research programs. . . . Second, we must be realistic and at the same time opportunistic. By that I mean that we must be able

and willing to shift and make curriculum adjustments when and only when the need is clear and has been definitely established. . . . Third, we must, in making adjustments, escape the danger that is involved in . . . dropping old and tested types of education. . . . Society can ill afford to tear down for the duration all of the tested disciplines upon which has been built the strength of our democracy and to substitute therefor a narrowly practical curriculum stressing only military measures to meet the present emergency."

Another topic of prominence was that of fostering increased relations with Latin America. This discussion was opened by Dean E. J. Kyle, of Texas, in an address before the general session entitled *The Mission of the Land-Grant Colleges in Promoting Our Good-Neighbor Policies Among the Latin-American Republics*, and subsequently further developed by him before the section of agriculture under the subject of *Our Relations to the Agricultural Economy of the Latin-American Countries and What It Means to Proper World Stabilization at the Close of World War II*. One session of the subsection of resident teaching was given over to a discussion of problems of cooperation, and a paper by Dr. R. H. Allee, Chief of the Division of Latin-American Agriculture of the U. S. D. A. Office of Foreign Agricultural Relations, was presented before the agricultural extension subsection on the subject *How Can the Extension Service Assist in Carrying Out the Recommendations of the Inter-American Conference on Agriculture at Mexico City?*

Dean Kyle presented brief notes as to the status of a considerable number of Latin-American educational and research institutions scattered from Mexico to Argentina as visited by him during the late summer and fall of 1941 under the auspices of the Coordinator of Inter-American Affairs. In general he found vast natural resources but an urgent need for trained specialists for their development. "I am thoroughly convinced," he declared, "that the United States has its best opportunity to promote complete and lasting understanding and friendship with our neighbors to the south by cooperating with them on a strictly practical basis in the development of their courses of study in agriculture, engineering, and in veterinary medicine, and in aiding them to better equip their physical plants and to strengthen their faculties."

Additional information was given by Dr. E. N. Bressman, head of the newly established Inter-American Institute of Agricultural Sciences (E. S. R., 87, p. 758) and by Dr. R. E. Moore, Assistant Director of the Office of Foreign Agricultural Relations, who, in a paper on *Agriculture in the Program of Inter-American Cooperation*, discussed the broad program which the United States Government has been developing through many agencies working under the gen-

eral supervision of the Interdepartmental Committee on Cooperation With the Other American Republics and specifically with those phases operated by the Department of Agriculture as regards the establishment of cooperative agricultural experiment stations, the inauguration of extension education, and the training of citizens of the several republics for eventually assuming the leadership in both the research and extension work. Already, he pointed out, "cooperative agricultural experiment stations are being inaugurated in Ecuador, El Salvador, Nicaragua, and Peru, to enable people of those countries to apply their own resources and ingenuity to the satisfaction of their economic needs. Every effort is being made to adapt these efforts to local conditions, but the work will be integrated in such a way that common goals may be achieved. Disease-resistant and high-yielding strains of rubber and other plants are being introduced. Many improvements in cultivation should result. Both the countries in which the stations are located and the United States are contributing certain portions of the equipment and personnel required. It is hoped that ultimately the direction of these stations will be in the hands of the people of the country themselves."

As usual all matters of association business were considered and decided by its executive body behind closed doors. The trend in recent years to apply similar methods of procedure to matters before the sections and subsections was continued and extended, so that much that went on is not available for comment. It is hoped, however, to present additional details of some of the research aspects in the February issue of the *Record*.

Announcement was made of the election as president for the coming year of President Edmund E. Day, of Cornell University. Dean and Director C. B. Hutchison, of California, was reelected vice president, and Dean and Director T. P. Cooper, of Kentucky, secretary-treasurer. President J. J. Tigert, of Florida, was reelected to the executive committee, and Dean O. J. Ferguson, of Nebraska, was succeeded on this committee by Dean M. L. Enger, of Illinois. A list of section officers and committee appointments may be found on page 143 of this issue.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 46, 47).—These include work on the polarimetric determination of lactose in milk, by E. R. Garrison; and on the use of petrographic microscope in studying the different types of lactose crystals in sandy ice cream, by W. H. E. Reid, C. W. Decker, and W. S. Arbuckle.

[Chemical investigations by the Nebraska Station] (*Nebraska Sta. Rpt.* [1941], pp. 41-43, figs. 2).—Baking characteristics of flour are reported upon by R. M. Sandstedt and K. Fortmann, and starch and amylase in flour, by Sandstedt, E. Kneen, and C. M. Hollenbeck.

Factors to be considered in quantitative polarography, I. M. KOLTHOFF. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 195-200, figs. 5).—This paper is mainly concerned with those factors that are of primary importance when dealing with mixtures of electroreducible substances. In general, oxygen should be removed from the solution before electrolysis is started, as by passing nitrogen or hydrogen through the solution in the cell for from 10 to 20 min. or, in neutral or alkaline media, by adding solid sodium sulfite. In order to get reproducible results with the same capillary and the same solution, the pressure on the dropping mercury should be kept constant. The value of k in the relation $i_d = kC$ (i_d being the true diffusion current and C the concentration) is considerably affected by a change of the solvent. In water-alcohol mixtures k is much smaller than in water. The diffusion currents of most substances increase by from 1.3 to 2.0 percent per degree increase in temperature, owing chiefly to the increase in the diffusion coefficient with increasing temperature. In order to find the true diffusion current the migration current has to be eliminated. This is done by making the concentration of the indifferent electrolyte about 50 times greater than that of the reduced ion. If the migration current is not eliminated, there is no longer proportionality between i_d and the concentration. For reasons discussed in some detail, the author prefers an outside reference electrode (the saturated calomel half-cell) to the use of a pool of pure mercury in the cell as an internal reference electrode. Numerous other matters of technic are taken up, together with their theoretical bases.

Some applications of the polarograph in soil investigations, R. W. CUMMINGS and J. F. REED. (Cornell Univ. coop. La. State Univ.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 167-170, figs. 4).—The authors briefly discuss the polarographic method as applied (1) to the determination of copper and zinc in plant ash, and (2) to the study of metal organic complexes as illustrated by the behavior of the ferric-ferrous-oxalate system. They believe that the polarographic method may prove serviceable in the study of some of the more complex oxidation-reduction changes occurring in soils.

Embedding specimens in methacrylate resins: A selected list of references with annotations, G. R. FESSENDEN and C. E. SANTO (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin.*, 1942, ACE-174, pp. [1]+9).—These references are divided into three sections—(1) those relating to processing data and to physical and chemical characteristics of methacrylate resins, (2) those describing speci-

men-embedding technic, and (3) those dealing with proposed use of these resins in microscopic preparations. Annotations have been included to facilitate finding the particular information sought. Some of the papers noted in section 1 discuss optical properties, scratch resistance, and other properties directly related to specimen mounting and use in microscopic work. Several of the papers listed as section 3 note shrinkage of the mounting medium with subsequent bubble formation in the mounts and the fading of certain stains.

A cutter for spectroscopic electrodes, E. S. HODGE. (Ky. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, p. 260, fig. 1).—The device described consists of two telescoping sleeves, of which the outer fits over the carbon to be cut, the inner sleeve, of an outside diameter the same as that of the carbon, fitting a drill which is to form the crater. The outer or centering sleeve is attached to the inner, and the inner sleeve to the drill, by means of setscrews.

Dissolved oxygen recordings with the dropping mercury electrode, R. S. INGOLS. (N. J. Expt. Stas.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 256–258, figs. 4).—The variations in the dissolved oxygen produce changes in the current flow which are amplified and recorded upon a thread galvanometer for a 24-hr. period. The curves showing the dissolved oxygen in activated sludge-sewage mixtures in the laboratory under different conditions demonstrated that the shape of the vessel can largely determine the efficiency of the gas used for aeration. The effect upon the dissolved oxygen of the addition of different quantities of the same food to activated sludge indicated that when more food is added there is no effect upon the dissolved oxygen unless or until the enzyme capacity is large enough to handle the increased load. The electrodes were placed in the aeration tank of an activated sludge-sewage treatment plant, and the dissolved oxygen levels at several points in the tank were recorded continuously for 24-hr. intervals. The first section of an aeration tank showed no dissolved oxygen during the day. The dissolved oxygen increased during the night. There was a relatively large volume of dissolved oxygen in the final section of the aeration tank with only slight variations over the 24-hr. period.

Column for stripping solvents from extracted oils, F. H. SMITH. (N. C. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, p. 255, fig. 1).—A glass apparatus for laboratory use is described. The solvent recovery from five samples is reported as having varied from 85 to 93 percent.

Extraction of metals from aqueous solutions with dithizone, lead, L. P. BIEFELD and T. M. PATRICK. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 275–278, figs. 4).—The results of a series of studies on the effect of pH, diverse anions, and amount of reagent used in lead determinations with dithizone are reported. It was found that favorable pH ranges for extraction vary considerably with different masking anions, whereas only limited change occurs with variation in amount of excess reagent.

Clay and colloid content determination of soils using a rapid photoelectric procedure, M. L. JACKSON. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 50–60, figs. 3).—The coarse and fine clay contents of 38 soils, representing a considerable number of great soil groups and localities, were determined by means of a rapid photoelectric turbidity procedure and by the conventional pipette and mechanical separation procedures for control and comparison. Dispersion was effected by treatment of the soils with H_2O_2 , addition of $NaPO_3$ solution, and shaking. The turbidity measurements were made with the Evelyn photoelectric colorimeter, with a 6,600 a. u. wavelength light filter, in the selected test tubes ordinarily used with this instrument. Turbidity was defined as log

$10G_0/G$, G_0 and G being the galvanometer readings of the suspension medium (water) and the suspension, respectively. Turbidity was found to be proportional to concentration for low concentrations of a given suspension. The procedure consisted of two centrifugings of a suitably diluted aliquot of soil suspension for periods computed by the Stokes formula and reading the turbidity at 10 cm. for clay ($<2\mu$) and at 3 cm. for fine clay ($<0.2\mu$). The turbidity due to coarse clay (2μ - 0.2μ) was computed as the difference between these measurements. All turbidity readings were reduced to a uniform basis of unit dilution per gram of soil.

Turbidity measurements for coarse clay correlated closely with the percentage of coarse clay found by control methods. The correlation coefficient was $+0.97$. Turbidity measurements for fine clay correlated less closely with the percentages of fine clay, but when the soils were placed into two groups, by separating one group of poorly aerated soils low in free iron oxides from the others, the correlation was satisfactory. The percentages of fine clay from the turbidity and control methods had a correlation coefficient of $+0.98$.

Semiquantitative estimation of montmorillonite in clays, S. B. HENDRICKS and L. T. ALEXANDER. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 95-99, figs. 2).—Competitive saturation of montmorillonites and micaceous materials by the calcium and ammonium ions, the piperidine and hydrogen ions, and the ceric and hydrogen ions is reported upon as a basis for estimations. The $Ce^{++} - II^+$ distribution was found to be the most useful of the three for estimation of montmorillonites. In equivalent concentrations the micaceous materials preferentially take up II^+ , while the montmorillonites take up much more of the Ce^{++} . A knowledge of the quantities of both these ions held, together with the total exchange capacity, permits an estimate of the amount of montmorillonite present in mixtures.

Determination of K_2O in commercial fertilizers, using 95 and 80 per cent alcohol and acid-alcohol, O. W. FORD and C. W. HUGHES. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 217-218, fig. 1).—The authors find a definitely larger potassium value to be obtained with 95 percent in place of 80 percent alcohol in the determination of potassium in fertilizers by the Official method. This difference for fertilizers of from 12 to 40 units of plant food ranged from 0.13 to 0.19 percent K_2O . For potassium chloride samples there was an average difference of 0.23 percent in favor of the use of 95 percent alcohol.

Phospholipids in dairy products.—I, Determination of choline in milk fat, J. C. CRANE and B. E. HORRALL. (Ind. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 8, pp. 651-658).—A microtechnic, based on a modification of the Roman method for the determination of choline, was found to be applicable to the analysis of extracted milk fat for choline, thus providing a method for the determination of choline-bearing phospholipids in dairy products.

A colorimetric method for estimating the quality of butter.—A preliminary report, G. KNAYSIL and E. S. GUTHRIE. (Cornell Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 7, pp. 589-593).—The described test, which is a measure of the degree of hydrolysis of butterfat, consists in dissolving 1 cc. of the melted milk fat in chemically pure xylol saturated with the base of neutral red and comparing the color with standards containing known quantities of oleic acid. It is found useful for quickly detecting bad samples and the majority of fair or good samples of butter and should prove a valuable adjunct to organoleptic judging.

A new colorimetric method for the determination of free fatty acids in milk fat, V. N. KRUKOVSKY and G. KNAYSIL. (Cornell Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 8, pp. 659-661).—A more detailed description of the method noted above, with supporting data.

Evaluating starches for textile purposes, W. T. SCHREIBER and W. L. STAFFORD. (U. S. D. A. and Ala. Polytech. Inst.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 227-231, figs. 7).—Procedures for evaluating starches for use on fabrics include methods for judging the starch mixtures from a processing or plant operating viewpoint and methods for evaluating the quality of starched fabrics. The former may be used for measuring the stickiness of starch mixtures during ironing and the penetration of such mixtures, the latter to measure the transparency of starch films and to determine the smoothness, stiffness, and resistance to crushing of starched fabrics. These methods may also be used to advantage in evaluating other sizing or finishing agents. Apparatus for each of these tests is described and illustrated by photograph.

Ultraviolet absorption of vitamin A in various solvents, F. P. ZSCHEILE and R. L. HENRY. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 5, pp. 422-425, figs. 2).—Absorption values, obtained by a procedure described as to instruments, source of irradiation, slit widths employed, derivation of $E_{1\text{ cm.}}^{1\%}$ and purification of reagents, are presented by graph for vitamin A in diethyl ether and various alcohols and of vitamin A palmitate in ethanol from 2,240 to 3,760 a. u. Similar data are presented for solutions in several hydrocarbon solvents. The numerical $E_{1\text{ cm.}}^{1\%}$ values for all preparations in the solvents studied, at wave lengths 3,260 and 3,280 a. u., are tabulated. The absorption curves showed that for most solvents a definite inflection appeared in the region of 3,150 a. u., this being more pronounced for one sample of vitamin A than for the other samples examined. With one exception, the maximum of absorption was found at wave lengths shorter than 3,280 a. u., usually at 3,260 a. u. These findings, it is noted, are slightly different from the wave length of 3,280 a. u. usually given for the maximum. The curves of all preparations examined in the region of lower wave lengths had a second maximum. These results and others cited indicated that small differences exist among the most carefully prepared samples of vitamin A and that the solvent has a definite effect upon the maximum absorption value.

A simple, rapid method for determination of leaf carotene, O. F. CURTIS, JR. (Cornell Univ.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 133-136, fig. 1).—A fresh leaf sample, dipped in boiling water for 1 min to prevent subsequent oxidation, is blotted to remove excess water and extracted with petroleum ether containing about 2 percent of methyl alcohol by grinding with quartz sand in a mortar. The extract is decanted, and the extraction is repeated with small successive portions of the solvent until no more pigment is removable. Separation of the pigments is accomplished by a chromatographic adsorption technic, using soluble starch as the adsorbent. The leaf extract is poured on the prepared column, suction is applied, and the chromatogram is developed with petroleum ether. Carotene, carotenoids, and colorless fat-soluble substances pass through the column almost completely, leaving the chlorophyll and xanthophylls in the column. The solution obtained is used without purification for quantitative measurement of the carotene by means of the photronic colorimeter. With this method the colored impurities are of no concern. It is pointed out that the carotenoid fraction of many leaves consists only of β -carotene; other carotenes if present rarely comprise more than 10 percent of the fraction. The method is accurate and rapid, and by the use of several adsorption columns connected with an aspirator through the same suction flask several determinations may be conducted at one time. Critical attention to the preparation of the

adsorbent is not required, and the adsorption column may be regenerated with ether to serve for at least five separations.

Some assays of provitamin A carotenoids, G. MACKINNEY, S. ARONOFF, and B. T. BOENSTEIN. (Univ. Calif.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 5, pp. 391-395, figs. 3).—"An endeavor is made to present the problem of provitamin A carotenoid determination in plant materials in broad perspective. Results on carrots, spinach, tomatoes, apricots, peaches, and prunes are discussed, particularly with reference to preservation practices. The problem is essentially that of β -carotene determination, because α -carotene is at best a minor contributor and cryptoxanthin is important only in special instances. Each material presents a different problem, sometimes of extraction, but more frequently in effective removal of interfering pigments without vitamin activity. The answer then is found in selection of suitable adsorbents with the proper solvent, and separation is made on small Tswett columns over which β -carotene or cryptoxanthin may be passed without adsorption, but where other pigments are effectively adsorbed. Because data on vitamins are so frequently interpreted in terms of human needs, and much effort is being devoted to vitamin surveys at the behest of State nutrition committees, the significance of the various findings is briefly evaluated in terms of bio-assay and nutrition."

Resynthesis of biotin from a degradation product, D. B. MELVILLE, K. HOFMANN, and V. DU VIGNEAUD. (Cornell Univ.). (*Science*, 94 (1941), No. 2439, pp. 308-309).—The diaminocarboxylic acid obtained as a degradation product of biotin through treatment with $\text{Ba}(\text{OH})_2$ was converted back to biotin through a reaction employed for the synthesis of urea derivatives, namely, through treatment with phosgene. The resynthesized biotin, obtained as a crystalline product from the reaction mixture in 98 percent yield, was shown to be identical in melting point, optical activity, and biological potency with the natural product, indicating that little or no racemization took place during the $\text{Ba}(\text{OH})_2$ treatment of the biotin. The synthesis of biotin from the diamino compound afforded additional and conclusive proof for the cyclic urea structure in biotin.

The extraction of biotin from tissues, R. C. THOMPSON, R. E. EAKIN, and R. J. WILLIAMS (*Science*, 94 (1941), No. 2451, pp. 589-590).—Six methods of extraction were applied in tests involving the use of liver, brain, and muscle tissues; egg yolk (plain and dialyzed); egg white saturated with biotin; and cells of *Pseudomonas fluorescens* and *Clostridium butylicum*. Biotin yields from these materials, subjected to the different treatments including hot and cold water extraction, autolysis, acid hydrolysis, enzyme digestion for 24 and 48 hr., and alkaline hydrolysis, indicated that the surest method for extracting biotin consisted in drastic acid hydrolysis (6 N acid at 120° C. for 2-5 hr. or at 15 lb. pressure for 1 hr.). Alkaline hydrolysis was unsuitable, since it brought about a gradual destruction of the vitamin. Prolonged heating with acid also caused some destruction. Beef and rat liver were found to have a biotin content of about 3.5 γ per gram of dry tissue, this value being many times higher than values previously reported.

A color reaction for dehydroascorbic acid useful in the determination of vitamin C, J. H. ROE and C. A. RUEYER (*Science*, 95 (1942), No. 2455, p. 77).—The reaction described involves the reaction of 1 cc. of a dilute acetic acid solution of dehydroascorbic acid with 1 cc. of a saturated solution of 2,4-dinitrophenylhydrazine in 85 percent H_3PO_4 . After 5 min. 8 cc. of concentrated H_2SO_4 is added. A red color develops, and the reddish colored product shows maximum absorption at 500-550 $m\mu$ and 350-380 $m\mu$. The proportionality of the color obtained in the reaction is in good agreement with Beer's law, and the reaction has been used, therefore, in a simple and rapid colorimetric method for the deter-

mination of ascorbic acid. Possible interfering substances are pentoses, glucose, and fructose, but only in concentrations much greater than those usually obtained in acid extracts of plant and animal tissues. Furthermore, the absorption curves of the xylose, glucose, and fructose derivatives of 2,4-dinitrophenylhydrazine and also of this reagent itself show practically complete transmission in the wave lengths at which the red color obtained from dehydroascorbic acid is compared. The reaction, therefore, is considered specific for the determination of ascorbic acid.

Fruit as sugar savers in candy making. W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 11, pp. 324-325, 349).—Dried fruits, it is pointed out, contain from 50 to 65 percent of sugar and are, therefore, excellent substitutes for sugar in certain kinds of candy to which they are adapted. Several formulas found satisfactory on a small scale are given for uncooked, dried fruit candies made with some sugar; fruit rolls made from dried fruit and a little honey, orange concentrate, or invert or other heavy sirup as a binder; and fruit jelly candies made from fruit pulp or juice, sugar, invert or glucose sirup, and fruit pectin as the jellying agent.

Chemical composition of Arkansas-grown American grapes. H. REYNOLDS and J. E. VAILE (*Arkansas Sta. Bul.* 420 (1942), pp. 53, figs. 3).—Total solids, sugar, acid, ash, alkalinity of ash, tannin, total astringents, and pH were determined and juice color descriptions recorded for juices extracted by hot-pressing 62 varieties of American grapes grown at the main station vineyard during 1938-41. Data showing the relative composition and color of hot- and cold-pressed juices from a number of varieties are included. Additional data from the analysis of Concord grapes dealing with the effect on juice composition of holding grapes before pressing, size of sample, uneven ripening, thinning and dormant pruning, comparative composition of the juice and whole fruit, and comparative composition of fruit from the main station vineyard with that from other vineyards in northwestern Arkansas are also reported. Samples for analysis were taken at the earliest date when edible and sufficiently colored to meet the standards for U. S. No. 1 table grapes (eastern type).

The chloroacetic acids as preservatives for apple juice. F. W. FABIAN and E. F. BLOOM. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 10, pp. 292-296).—In experiments described it was found that unclarified apple juice had from 40 to 50 times more micro-organisms present than clarified juice, and that after about 7 days neither the unclarified nor the clarified juice was salable as fresh apple juice, the former because of alcoholic fermentation and the latter because of acetic acid fermentation. Mono-, di-, and trichloroacetic acids in this order exhibited decreasing preserving actions in tests with the two types of apple juice. In comparative trials benzoic acid and monochloroacetic acid had about the same preserving action under practical conditions, though the growth of micro-organisms was inhibited to a somewhat greater extent by the benzoic acid. Both chemicals were more effective against yeasts than against acid-producing bacteria. "Monochloroacetic acid apparently has no superior preserving qualities over sodium benzoate and has the disadvantage of being an adulterant and its use prohibited by law."

Results of a demonstration sale of fruit juice blends. H. G. BEATTIE and C. S. PEDERSON. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 8, pp. 227, 240, 251, 253).—A summary of consumer questionnaires indicated favorable response to the five fruit beverages prepared in the fruit juice laboratory at the New York State Station and offered for sale to a limited group consisting of people experienced in judging fruits and fruit flavors. The juices included apple juice, apple-raspberry juice, cherry cocktail prepared

as previously directed (E. S. R., 79, p. 588; 85, p. 848), a cherry-apple juice, and a plum-apple juice. Directions are given for the preparation of the two latter juices, both of which are clarified products. The cherry-apple blend was made in much the same way as the cherry cocktail except that apple juice was used as the diluent instead of water.

Cider-apple jelly, S. G. DAVIS, C. R. FELLERS, and A. S. LEVINE. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 9, pp. 260-261, 283, fig. 1).—This paper presents production details of an investigation to develop a satisfactory cider-apple jelly. "A cider-apple jelly of highly desirable taste, flavor, and color was prepared by adding sweet Baldwin cider, concentrated to one-third its original volume, to the heat-extracted apple juice from an equivalent weight of apples. The amount of dry sugar added was about 60 percent of the weight of the apple stock used. The remainder of the sugar was naturally present in the added cider. The mixture of the concentrated cider, extracted apple juice, and sugar was concentrated by boiling to a soluble solids content of 68 percent by the usual jelly manufacture procedure." Details of the formula and procedure for obtaining this jelly are presented.

The effect of certain substances and pretreatments on the retention of color and sulphur dioxide by dried cut fruits, E. M. MRAK, C. D. FISHER, and B. BORNSTEIN. (Univ. Calif. et al.). (*Food Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 10, pp. 297-299, fig. 1).—Since poor retention of color in dried apricots has been associated in part at least with poor SO_2 retention, a sodium citrate (5 percent) dip, applied before or after cutting but before sulfuring, was tested and found to favor SO_2 retention during drying. The fruit in some but not all cases retained a better color for a longer time than any of the samples dipped in other solutions (water, trisodium phosphate, sodium bicarbonate, calcium hydroxide, tartrate, or citric acid) or sprayed with the sodium citrate or given no treatment. SO_2 retention apparently did not account entirely for color retention, since not all samples retained good color and since loss of SO_2 during storage (50-percent loss in 6 mo.) was not accompanied by color loss. A 30-sec. dip of whole fruit in 5-percent sodium citrate solution favored color retention, but a 5-min. immersion period apparently caused excessive leaching, since color retention was poor.

Souring of dried dates by sugar-tolerant yeasts, C. R. FELLERS and J. A. CLAGUE. (Mass. State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 11, pp. 326-327, 347, figs. 2).—Sour dates, characterized by being soft, dark-colored, and matted together, and having a peculiar aromatic odor and poor flavor, were obtained for examination from lots imported from Iraq and Algeria. Saprophytic molds, yeasts, and sporulating bacteria, but far more yeasts than bacteria, were found present. Six types of sugar-tolerant yeasts, representative of the many types encountered, were isolated, characterized, and shown, through reinoculation into sound, pasteurized dates of high moisture content, to produce typical souring. The Khadrawy variety was more prone to souring than the Halawy or Sayer varieties. Although yeasts, mainly *Torula* and *Willia*, were largely responsible for the souring, *Acetobacter* were often present as secondary invaders. The yeasts did not produce souring in dates if the moisture was below 25 percent; 23 percent is suggested as a safe moisture maximum for market dates. The pasteurization of dates effectively destroyed all the date-souring yeasts.

Rapidly refreshing dehydrated vegetables, J. SUGIHARA and W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 8, pp. 239-240, fig. 1).—Vegetables dehydrated with and without preliminary blanching were cooked for 10-, 15-, 20-, 30-, and 40-min. intervals, the drained weights

being recorded for each time interval to determine the rate of resorption of water. The results showed that blanching aided the rate of regain of water and that, with the possible exception of the leafy vegetables, the limiting factor for complete cooking was the rate of absorption of water. Most of the vegetables blanched long enough to cook completely could be cooked in 15 min. without presoaking. In all cases the blanched, refreshed products were equal or superior to the unblanched in color, odor, and flavor. In unblanched vegetables soaked overnight the production of a tender product upon cooking was inhibited, due apparently to enzymatic activity.

Public health compliance by manufacturers of paper for packaging perishable foods, J. R. SANBORN. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 5 (1942), No. 2, pp. 88-93).—An investigation in 1937-38 of the bacteriological condition of paperboard used for milk containers showed that most of the 22 mills investigated were able to meet with fair consistency a standard of less than 500 colonies per gram, while several of the largest producers met a standard of less than 250 colonies. An investigation in 1941-42 of 4 of the 7 or 8 mills continuing to make milk-container board showed a maximum count of 140; in 2 of the mills 81 and 90 percent of the tests, respectively, gave counts between 0 and 10. Studies of the experiences of these and other mills showed that the growth of micro-organisms in pulp, paper, and paperboard could be effectively controlled by locating the origin of contamination and focal points of growth and by persistently applying efficient remedies and control, from raw stock, through the various processes, including the final step of calendering. References cited concern mixers found suitable for disintegration of paperboard, microbiological methods satisfactory for determining the bacteriological content, interpretation of the counts, and standards for the paper products.

AGRICULTURAL METEOROLOGY

Temperature contrasts in the United States, S. S. VISHNER (*Sci. Mo.*, 55 (1942), No. 3, pp. 239-244, figs. 8).—Wide contrasts with respect to several significant temperature conditions in the United States are shown by the accompanying maps, based on data for 40 yr. (1890-1938), and most of them using records from about 5,000 stations. Data are shown on the maps for the average January temperature ranges, average annual minimum temperatures, lowest temperatures, average depth of frost penetration, average length of the frost-free period, average July temperature, highest temperatures experienced during the normal summer, and the highest shade temperatures officially recorded. Seven major influences noted for the pronounced regional contrasts in temperature are latitude, length of day and night, altitude, the ocean, inland water bodies (especially the Great Lakes), atmospheric humidity and soil moisture, and normal wind direction.

Effects of the Great Lakes on the annual march of air temperature in their vicinity, J. LEIGHLY. (Univ. Calif.). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 27 (1941), pp. 377-414, figs. 17).—In this discussion, and particularly in the accompanying maps, the author reports an investigation of the thermal influences of the Laurentian Great Lakes on the annual cycle of air temperatures over the lands about them. Being concerned mainly with the general problem of the role of these lakes in the heat economy of the atmosphere above and about them, it has necessarily dealt with the most general qualities of the annual march of temperature. However, attention is also called to climatic elements of some immediate practical importance that would yield to the cartographic procedure used, such, e. g., as the average maximum and minimum

temperatures at the extremes of the annual march, maximum and minimum temperatures at times that are critical in relation to certain crops and on days to which some particular interest may attach, and on precipitation. In all such climatic phenomena it should be possible to dissect out the effects of the lakes and to make more precise the rather indefinite impressions that are now the only available basis for statements concerning their climatic influence.

Rainfall evaluation as an aid to irrigation interval control, J. A. SWEZEY (Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 46 (1942), No. 2, pp. 75-100, figs. 11).—The evaluation of normal amounts of rainfall as supplementary irrigations on Hawaiian sugarcane lands has for years been attained by individual judgment, and thus influenced largely by personal considerations. More recently studies of soil moisture and cane growth relationships have indicated that a program of regular, routine soil-moisture observations could be expected to provide information relative to the elapsed time between successive irrigations which would furnish the cane plant with water at the most efficient frequencies on a basis of the commercial product. In September 1939 at Waipio a rain of 1.54 in. in a 24-hr. period fell on 32 experimental plats which had a considerable variation in their initial soil moisture contents. An opportunity was thus afforded to analyze the effects of this rain toward replenishing soil moistures under the varied conditions existent. From this analysis a set of curves, one for each 0.1-in. increment of rainfall, was derived which would correct an irrigation interval for such rainfall as might occur at any time between scheduled irrigations. The elapsing interval and the correction for rainfall were expressed in day-degrees, so as to take advantage of this method of gaging intervals, the correction to be deducted from the elapsed interval. These corrections were further tested and adjusted in the field for 2 more years and a method of rain evaluation said to be both workable and practical is offered which combines scientific theory, recognition of the character and influence of conditions observed in the field, and a reasonable degree of conservatism.

The derivation of the adjustments for use at Waipio are described in detail, and rules are presented for operating a day-degree-measured irrigation interval with the aid of the adjustment table. In the course of deriving the adjustments, a revised concept of the term "permanent wilting percentage" is discussed, and the significance of the "wilting range" in affecting the method of applying the interval adjustments is presented. Eight other adjustment tables are included which it is believed should provide for evaluating rainfall on soil types differing from that at Waipio. Experimentation to determine the local optimum interval is suggested as an adjunct to successful use of the table most suited to a given soil type.

Centuries-long tree indices of precipitation in the Southwest, I, II, E. SCHULMAN. (Univ. Ariz.). (Amer. Met. Soc. Bul., 23 (1942), Nos. 4, pp. 148-161, figs. 11; 5, pp. 204-217, figs. 6).—Tree-ring series, if proved to be climatic records, have much potential value, but significant dendrochronological work must recognize the importance of selection of specimens and cross-dating of records. Douglas fir was found to be one of the best recorders of precipitation, and this species and ponderosa pine form the basis of the present study. Synchronous fluctuation in annual growth is illustrated in many selected trees in the southwestern United States. Curves of mean annual growth are given for five areas, covering 300-560 yr. Growth curves are shown to represent to a marked degree the recorded year-to-year fluctuations in winter precipitation for five representative areas of the Southwest. The precipitation spectrum of wet and dry years appeared nearly identical at nearby and at high- and low-level stations. In the Southwest, trees under the climatic stress of precipitation deficit may disagree in ring

chronology with others a few yards away but not under climatic stress, yet may closely parallel trees on difficult sites 400 miles away. Summer precipitation in this area, roughly 50 percent of the annual total, has little influence in general on variations in ring thickness in Douglas fir and ponderosa pine, and no general effects of annual temperature variations were found in the ring records. Tree growth in the Gila River headwaters provided a centuries-long and closely approximate index of runoff. Comparisons of chronologies across 400 miles north-south and 250 miles east-west emphasized that even in regions of generally similar climate there is a changing areal domain under the influence of drought in different years—a persistent feature of the three centuries of data. A method is suggested for quantitatively delineating a homogeneous dendrochronological area, interpretable as a climatic unit. The average duration of excess (wet) or deficient (dry) growth in the Southwest is about 8-9 yr., on the basis of the last three centuries of data. Since 1640 about 4 percent of the years there are characterized by extreme winter droughts with growth less than half the normal, and about 15 percent of the years show growth less than three-fourths of normal. In some areas the absence and in others the presence of the sunspot cycle in tree growth leads to the suggestion of a possible relation to climatic latitude.

Climatic types of California, according to the decimal scheme of world climates, W. GORCZYNSKI (*Amer. Met. Soc. Bul.*, 23 (1942), No. 4, pp. 161-165, fig. 1).—As shown in the accompanying chart the author distinguishes 5 large climatic groups divided into 10 types. The limits of each type are given, and the occurrence of each type and group in California and the peninsula of Baja California and throughout the world are tabulated, together with the world areas having the best climatic type. An example for computing the aridity factor is presented.

Monthly Weather Review, [May-June 1942] (*Mo. Weather Rev.* [U. S.], 70 (1942), Nos. 5, pp. 93-115, pls. 10; 6, pp. 117-151, pls. 10, figs. 14).—In addition to meteorological, climatological, solar radiation, and sunspot data, these numbers contain the following contributions: No. 5, Oxygen Deficiency in Antarctic Air, by E. E. Lockhart and A. Court (pp. 93-96); and No. 6, The Heavy Rains Over Southeast Texas, November 22-25, 1940, by J. H. Ferguson (pp. 117-133).

Central Snow Conference (*Cent. Snow Conf. Proc.*, 1 (1941), pp. VII+214, figs. 95).—The following papers are of interest to agricultural meteorology: The Role of Snow, Ice, and Frost in the Hydrologic Cycle, by R. E. Horton (pp. 5-21); The Melting of Snow, by J. E. Church (pp. 21-31) (Nev. Expt. Sta.); Some Factors in Relating the Melting of Snow to Its Causes, by W. T. Wilson (pp. 33-41); Preliminary Study of Radiation Penetration Through Snow, by I. F. Hand and R. E. Lundquist (pp. 42-44); The Influence of Snow Cover on Air Temperature, by H. Landsberg, G. P. Cressman, and H. K. Saylor (pp. 45-49); Upper Limits of Snow Melting, by P. Light (pp. 49-51); Relationships of Winter Weather to Farmland Wildlife in the Midwest, by D. L. Allen (pp. 95-102); Snow and Game in Northern Michigan, by I. H. Bartlett (pp. 102-105); Snow and Ice Conditions Affecting Forest Game, by H. F. Olson (pp. 105-107) (U. S. D. A.); The Effect of Openings in a Young Lodgepole Pine Forest on the Storage and Melting of Snow, by C. H. Niederhof and E. G. Dunford (pp. 108-109) (U. S. D. A.); Snow in Its Relation to Silviculture, by J. N. Spaeth (pp. 109-112) (Univ. Ill.); The Influence of Snow Cover on Fruit Production, by N. L. Partridge (pp. 113-115) (Mich. Sta.); Observations on Snow Cover as Affecting Farm Crops, by P. O. Ripley (pp. 116-123a); Snow Utilization in Prairie Agriculture, by G. D. Matthews (pp. 127-133); Economic Significance of Snowfall and Snow Retention on Western Watersheds, by W. W. McLaughlin (pp. 134-135) (U. S. D. A.); Snow Ridging to Conserve Moisture, by T. E. Long (pp. 136-137) (N. Dak. Agr. Col.); Seasonal

Fluctuations of Precipitation Intensity Frequency Values in the Ohio Valley, by R. E. Allen (pp. 138-151) (U. S. D. A.); Snowfall—Maps of Canada, by A. J. Connor (pp. 153-159a); Snow Measurement in Pennsylvania, by L. F. Conover (pp. 160-165); and Some Characteristics of Winter and Non-Winter Floods in the St. Lawrence River Drainage Basin, by W. G. Hoyt (pp. 176-190). Most of the articles are followed by discussions.

SOILS—FERTILIZERS

Federal-State cooperation in soil-plant research, E. C. AUCHTER. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 3-7).—This is a general discussion dealing with advantages of closer relationships among soil scientists and between them and scientists in other fields, this viewpoint being illustrated by a number of examples of successful cooperation between Federal and State research institutions.

[**Soil investigations by the Arkansas Station**] (*Arkansas Sta. Bull.* 417 (1942), pp. 5-6, 17-18, fig. 1).—Results of investigations of soil and water losses under different types of cropping methods are reported by R. P. Bartholomew and D. G. Carter. Experiments with phosphates in various areas of the State indicate that application of phosphates will result in increased yields on upland soils.

[**Soil investigations by the Missouri Station**] (*Missouri Sta. Bul.* 444 (1942), pp. 76-79, 80, 81-88, figs. 2).—Progress of crop rotation and fertilizer experiments are reported by W. A. Albrecht and G. E. and N. C. Smith; value of timothy hay as sheep feed in response to the soil treatment, by A. G. Hogan, Albrecht, and G. Norwood; land classification of Missouri, by H. H. Krusekopf; permanent pastures, by C. E. Marshall, Albrecht, N. C. Smith, and R. A. Struchtemeyer; the determination and mapping of Missouri soil types—soil survey, by Krusekopf, W. D. Shrader, and E. M. Springer; the best systems of soil management for the most important soil types in Missouri, by G. E. and N. C. Smith; the utilization of cornstalks and straw in soil building, by Albrecht and G. E. Smith; finely ground limestone for agricultural purposes, by Albrecht; effects of different soil treatments, long continued, upon bacterial activity in the soil, by Albrecht and D. R. Browning; a study of the nature of soil structure and its influences upon soil tillage, by C. M. Woodruff; the properties of colloidal material in Missouri soils, by Marshall, Albrecht, E. R. Graham, and C. E. Ferguson; soil erosion, by Krusekopf and Woodruff; and nitrogen fixation in soils by legumes, by Albrecht, Graham, and Ferguson.

[**Soil investigations by the Nebraska Station**] (*Nebraska Sta. Rpt.* [1941], pp. 6-12, figs. 4).—Progress of work on soil erosion control and soil moisture conservation is reported upon by F. L. Duley and J. C. Russel (coop. U. S. D. A.); results of various tests with different commercial fertilizers, by M. D. Weldon and J. W. Fitts; soil profile studies, by H. F. Rhoades and H. W. Smith; factors affecting the permeability of soils to water, by Rhoades and Fitts; and nitrate studies and soil organic matter, both by Weldon.

[**Soil investigations by the Texas Station**]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1941, pp. 23, 105-107, 122-124).—Experiments are noted on nitrification, by G. S. Fraps and A. J. Sterges; and soil and water conservation. Investigations at the Tyler Substation, by J. B. Pope and [J. C.] Archer, and at the Temple Substation, by W. J. Peevy.

Soil Survey of Iowa.—Reports 80-82 (*Iowa Sta. Soil Survey Rpts.* 80 (1941), pp. 56, figs. 14, map 1; 81 (1941), pp. 84, figs. 28, map 1; 82 (1942), pp. 51, figs. 15, map 1).—The three reports here noted continue the series (E. S. R., 84, p. 298), recording survey data obtained in Decatur County, by R. W. Simonson.

and in Marion and Ida Counties, by Simonson and T. H. Benton, and which supplement the Federal soil surveys (E. S. R., 82, pp. 18, 154, 591).

Soil survey of Albany and Schenectady Counties, New York, C. LOUNSBURY ET AL. (Coop. [N. Y.] Cornell Expt. Sta.). (U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.], Ser. 1936, No. 16, pp. 79, figs. 2, map 1)

Illinois loess—variations in its properties and distribution: A pedologic interpretation, G. D. SMITH (*Illinois Sta. Bul.* 490 (1942), pp. 137-184, figs. 15).—Primary attention was given in this progress report to the distribution of the loess deposits and to the relation between the character of these deposits and the distance from their source.

It is concluded that (1) differences in the texture of the loess bear, within limits, a linear relation to the logarithm of the distance from the river bluffs. (2) The rate of the thinning of the loess with the distance from its source is a linear function of the logarithm of the distance. (3) The carbonate content of the loess decreases as the loess becomes thinner. The relation between the carbonate content and the loess thickness is expressed by the equation $Y = a - \frac{b}{X}$, when Y equals the percentage of carbonates, X equals the thickness of the loess, a equals the carbonate content of the loess at the time of deposition, and b equals the loss of carbonates by leaching during the period of deposition. (4) The carbonate loss due to leaching during the deposition of the first quarter of the Peorian loess was approximately half as great as the leaching loss in the entire period subsequent to the loess deposition, showing that there was a very slow deposition of the loess. (5) The differences in the profiles of the grassland soils found in loess deposits of varying thicknesses are attributed to the differences in the age of that portion of the loess in which the solum is developed and to a possible influence of the substratum either through direct mixing with the loess by animals or through the return of bases or other nutrient elements to the surface by the grasses. (6) Many of the Prairie soils are not in equilibrium with their environment, the direction of their development being toward the condition of the Planosols.

Soil structure effects in the growth of sugar beets, L. D. BAYER and R. B. FARNSWORTH. (Ohio Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 45-48, figs. 3).—On the heavy clay soils of northwestern Ohio from blocking and thinning time to harvest losses of nearly 50 percent were experienced on plats where the noncapillary porosity was as low as 2 percent by volume. Soils with poor aeration produce short, stubby beets with many auxiliary roots. Well-aerated soils produce long, tapering beets. Soils with noncapillary porosities exceeding from 7 to 10 percent produce good tonnages of beets with high sugar contents. Increased aeration may be effected by turning under sod crops or manure, by surface applications of organic materials, or by ridging. The presence of organic matter in the surface of the soil not only causes a higher content of noncapillary pores but also preserves this favorable structural condition throughout the season. Maximum beneficial effects of fertilizers on this soil cannot be expected unless the structure of the soil is so improved as to permit adequate aeration for the growing beet.

Comparison of absorbent materials employed in the electrical resistance method of making a continuous measurement of soil moisture under field conditions, G. J. BOUYOUKOS and A. H. MICK. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 77-79, fig. 1).—Substances considered as possible substitutes for plaster of paris were cement, concrete, marble dusts, dental casting compounds, and lime plasters. Laboratory examination of these materials, however, showed that compared to plaster of paris their rate of moisture

absorption and, therefore, the establishment of an equilibrium between block moisture and soil moisture was relatively slow. The concrete block, for example, required 80 min. to become saturated when completely immersed in water as against 25 sec. required by plaster of paris. An examination of plaster of paris blocks buried and in use for three continuous seasons has shown that the tendency to soften is not of great practical importance. It appears that because of its physical structure, its solubility characteristics, and its cheapness and ease of handling, plaster of paris is at the present time the most satisfactory absorbent material for the resistance method of measuring soil moisture.

A field comparison of the electrothermal and gypsum block electrical resistance methods with the tensiometer method for estimating soil moisture in situ. R. W. CUMMINGS and R. F. CHANDLER, JR. (Cornell Univ.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 80-85, figs. 7).—Four tensiometers, six thermocouples, and six of each of the other moisture indicator units were installed at the 3-, 6-, 15-, and 30-in. depths below the surface of a sod plat on a Dunkirk silty clay loam soil. Natural-structure cores of the soil were used to obtain detector current- (electrothermal) moisture content and electrical resistance-moisture content curves in the laboratory. Electrothermal data showed extreme variability between units and did not, in this investigation, give a satisfactory measure of soil moisture conditions in the field. Laboratory studies made on isolated soil blocks by this method, on the other hand, gave universally satisfactory results. The difficulty of obtaining and maintaining adequate contact between soil and heating unit under field conditions seemed to be the principal source of difficulty. Gypsum blocks gave a rather satisfactory picture of the trend of soil moisture conditions. The possibility of calibrating the resistance of the gypsum blocks in terms of soil moisture tension and thus following actual tensions through drier ranges than can be measured by tensiometers is demonstrated. Variability in resistance readings from blocks placed under similar conditions seems to be due to inherent variability in the block itself and to the fact that the electrical current conductance path is partially outside the block. The possibility of redesigning the blocks so as to reduce these effects and thereby increase precision is suggested.

Movement of water through soils in relation to the nature of the pores. W. R. NELSON and L. D. BAVER. (Ohio Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 69-76, figs. 7).—The first objective of the work here recorded was to ascertain what actually happens in the drainage of pores, the second to show the relation of pore size to percolation rate.

Experimental investigations and theoretical analyses show that the permeability of the soil is related (1) to the volume of the pores drained at the flex point, (2) to the tension of the flex, (3) to the size distribution of the pores up to the flex point, and (4) to the continuity of the soil pore space. Additional investigations are necessary to clarify many of the doubtful points in soil-pore space relationships.

Effect of mulches and surface conditions on the water relations and erosion of Muskingum soils. H. L. BORST and R. WOODBURN. (Coop. Ohio Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul.* 825 (1942), pp. 16, figs. 8).—Straw incorporated into the soil at rates of 1, 2, and 4 tons per acre effected little or no reduction in runoff or soil loss when artificial rain was applied at about 2¼ in. per hour. The application of artificial rain to soil sealed by either natural or artificial rain resulted in a high percentage of runoff and heavy erosion.

Shallow cultivation to break the crust increased infiltration and reduced erosion. Application of a straw mulch at the rate of 2 tons per acre to a sealed soil (crusted surface) increased infiltration only slightly more than cultivation but afforded a nearly complete control of erosion. Application of a straw mulch at the same rate to a soil with the surface crust broken resulted in a high rate of infiltration and a very low soil loss. The straw mulch protected the soil surface from the impact of raindrops and from the formation of an impervious layer on the soil, caused largely by their dispersing action. The mulches also reduced the velocity of overland flow. The effect of the straw mulch on infiltration seemed to be in proportion to the amount of surface covered. In controlling erosion, 1 ton per acre was nearly as effective as 2 tons. Cornstalks applied at a rate of about 2 tons per acre, laid across the slope, were nearly as effective in controlling both soil and water losses as was straw at 1 ton per acre. The tests show that the surface condition has a pronounced effect on water intake.

Variability of eroded material, C. S. SLATER and E. A. CARLETON. (U. S. D. A. coop. N. Y. State Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 4, pp. 209-219).—For information on the extent to which eroded material differs in quality and texture from its original soil, a series of soil losses and the corresponding plat soils have been analyzed texturally and for their organic-matter content. Under conditions favorable to infiltration, texture of eroded material has been coarser than that of the corresponding soil, but under conditions of greater impermeability eroded material has been finer. These differences tend to disappear as erosion increases, and the composition of the eroded material approaches the composition of the soil. Irrespective of texture, eroded material has been shown to be somewhat higher in organic-matter content than the eroding soil, especially where small runoffs are incurred. This anomaly has been shown to be the result of organic debris that is removed preferentially by the eroding process. If the effect of organic debris is discounted, colloidal material removed by erosion has essentially the same organic-matter content as the colloidal material of the eroding soil.

Lysimeter studies: The translocation of cations in the profile of a Gray-Brown Podzolic soil, J. S. JOFFE. (N. J. Expt. Stas.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 187-190).—Calcium and magnesium movements showed a seasonal character, the elements concentrating during the period August through October, with the highest translocation rate in March. The movement of potassium through the A₁ horizon did not show this definite seasonal trend, but low and high rates appeared to alternate monthly. There was some evidence of an August maximum. The sesquioxides showed a behavior similar to that of the calcium and magnesium. Data concerning sodium were obtained during but 1 yr., as compared with 9 years' figures for the elements previously named. Most of the sodium came from the precipitation, but some appeared to be released from sodium feldspars. The quantity of manganese found appeared to decrease with increase in that of the alkaline earth bases.

Base exchange capacity determination as influenced by nature of cation employed and formation of basic exchange salts, C. A. BOWER and E. TRUOG. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 86-89, fig. 1).—The exchange capacities of the clay fractions of Miami silt loam and of a montmorillonite sample were determined by means of the cations of a monovalent group consisting of hydrogen, sodium, potassium, and ammonium, and of a polyvalent group consisting of barium, strontium, calcium, magnesium, beryllium, copper, manganese, zinc, ferric iron, lanthanum, and thorium. Results obtained with ammonium, calcium, and magnesium were also determined for a variety

of other clays. Exchange capacity values, determined by means of polyvalent cations, were significantly higher than those determined by means of monovalent cations. Results obtained with monovalent cations were in good agreement. Those obtained with polyvalent cations were values increasing with decreases in the strength of the bases which the respective cations form. The data obtained show that the weak base-forming, polyvalent cations form basic salts with the relatively weak clay acid to a degree depending upon the strength of base which the cation in question forms, and thereby give high exchange capacity values. It is believed that the results obtained may have considerable significance in connection with the determination of base exchange capacity and also the availability and toxicity of certain nutrient elements.

Soil reaction as a basis for certain land management practices: A symposium. (Coop. U. S. D. A. et al.). (*Fla. Univ. Agr. Ext. Misc. Pub. 30* (1942), pp. 36, figs. 6).—The contents of this publication consist of a foreword by R. V. Allison and discussions of Factors Affecting the Soil Sampling Procedure, by G. M. Volk and M. Peech (pp. 4-12); Routine Field Sampling and Notes, by A. White, E. L. Ayers, and R. E. Norris (pp. 13-16); Methods of Determination of Soil pH, by R. A. Carrigan (pp. 17-31); and of A Method of Reporting Results to the County Agent and to the Grower, by E. F. Debusk and L. H. Rogers (pp. 32-33), followed by a general discussion of the topics noted by H. G. Clayton, W. E. Stokes, A. F. Camp, and R. P. Thornton.

Nitrogen fixation by *Azotobacter* as influenced by molybdenum and vanadium, C. K. HORNER, D. BURK, F. E. ALLISON, and M. S. SHERMAN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 4, pp. 173-193, figs. 6).—Several strains of *Azotobacter* were grown in nonaerated solution cultures to determine the effect of vanadium and molybdenum on nitrogen fixation. Additions of optimum molybdenum resulted in a tenfold to thirtyfold increase in nitrogen fixation with eight strains of *A. chroococcum* and one strain of *A. vinelandii*. Nitrogen fixation was increased twofold with two strains of *A. agile* and three of *A. vinelandii* because of the presence of molybdenum. The presence of molybdenum usually resulted in slight increases in the nitrogen content of the cells. The effective concentration range for molybdenum and vanadium was found to vary from 0.00001 or 0.0001 p. p. m., which gave a detectable effect with *A. chroococcum*, to about 1 p. p. m., which gave maximum growth in 6 days. With younger cultures the range was appreciably narrower, 0.005-0.01 p. p. m. giving maximum growth for 1-day cultures. The concentration range for vanadium was approximately the same as for molybdenum, but the maximum effect was only from 50 to 80 percent of that produced by molybdenum. The effect of other elements to molybdenum response was similar to that obtained by other workers in establishing that both iron and molybdenum must be present in optimum concentrations for maximum growth and fixation. Manganese was found to have no appreciable effect on *Azotobacter* in the presence or absence of molybdenum.

Colony variation in actinomycetes under constant environmental conditions, K. L. JONES (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 255-258).—Colonies of five strains of soil actinomycetes were grown from single conidia on media of known composition under controlled environmental conditions. New series of plates were inoculated every 3 weeks for 1.5 yr. Variations were numerous but proved mostly temporary. The only permanent variations (six) were saltation mutations. There has been, so far, no difficulty in maintaining relatively constant strains. The activity lost from prolonged culture on laboratory media was restored by transferring to sterilized soil. There was no evidence that colony characteristics could not be considered trustworthy criteria in the delineation of these "species" of actinomycetes.

Studies on plant food availability in alkaline-calcareous soils: Seedling tests and soil analysis. W. T. MCGEORGE (*Arizona Sta. Tech. Bul. 94 (1942), pp. [2]+375-418, figs. 12*).—A comparison of the quantitative removal of phosphate, potassium, and calcium from alkaline-calcareous soils by various crops showed a good relative agreement for rye, barley, wheat, and tomatoes and a fair relative agreement for rye with cowpeas, corn, and hegari. There was a good correlation between the availability of phosphate, calcium, and potassium as measured by the carbonic acid method and the availability values obtained from the Neubauer (E. S. R., 53, p. 319) test. Factors found to be related to or to influence the absorption of these three ions were (1) phosphate absorption increases with decrease in pH, decrease in water-soluble calcium, carbonic acid-soluble calcium, and calcium carbonate; (2) potassium absorption increases with decrease in pH value; (3) calcium absorption increases with decrease in pH value; (4) phosphate Neubauer values correlate with the carbonic acid-soluble phosphate and with the calcium Neubauer values; (5) potassium Neubauer values correlate with increase in calcium Neubauer values, carbonic acid-soluble potassium, and replaceable potassium; and (6) calcium Neubauer values correlate with carbonic acid-soluble calcium and calcium carbonate but inversely with replaceable calcium. In varying the weight of soil in each 100-plant Neubauer culture there was observed a steady increase in phosphate value or milligram PO₄ per 100 plants up to from 80 to 100 gm. of soil, above which the value was closely constant. For potassium the Neubauer potassium value was closely constant above 100 gm. of soil. For calcium the Neubauer value curve showed less constancy, reaching maximum values at from 40 to 90 gm. soil, beyond which it decreased. When both number of plants and weight of soil are varied in the Neubauer test, the value on the basis of 100 plants decreases as the number of plants and weight of soil are increased. The curves obtained, both for phosphate and for potassium, on plotting values obtained by maintaining the number of plants constant at 100 and increasing the weight of soil per culture, showed practically horizontal curves above from 80 to 100 gm. of soil; the absorption was at a maximum and practically constant above this. It is believed that some point below 100 where the values are steadily increasing, possibly 50 gm. of soil, would give more satisfactory values.

✓ **The chemical composition of some pasture and hay plants as affected by soils and fertilizers.** B. A. BROWN and E. A. HOLLOWELL. ([Conn.] Storrs Expt. Sta. and U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 131-139).—Reviewing work not only of the [Connecticut] Storrs Experiment Station but also, with respect to some of the hay plants, of a number of other stations, the author shows the variations with locality and with other factors in the composition of grasses and legumes. Phosphorus was the element most frequently present in extremely small quantities. Causes either of acidity or of alkalinity of the soil may make the soil phosphate difficultly available to the hay plants, but the total phosphate of the soil may often be low enough to permit remarkable effects of phosphatic fertilization on grassland. The lasting qualities of such treatments are emphasized. It has been demonstrated that an application of 16 percent superphosphate at 500 lb. per acre on the run-out pastures of northeastern United States will increase the quantity and quality of the herbage for at least 14 yr. When superphosphate is the source of phosphorus, there is usually an increase in the calcium content of the grasses or legumes. In most of the humid areas calcium is the next most important limiting element. Evidence of the adequacy of the available potassium supply in soils for forage plants is much more conflicting than it is for phosphorus and calcium. The tables contain many examples of wide differences in the potassium content of plants

due to variations in soils or fertilization. There is some evidence that the land run out by grazing is much less in need of potassium than are adjacent areas depleted by removing the hay. However, on light soils or on soils under tillage for many generations the successful growing of forage plants, particularly legumes, depends upon conserving and returning manure to the land or on applying potassic fertilizers. Minor element deficiencies appear to have been more common among legumes than grasses.

The composition of corn, oats, and wheat as influenced by soil, soil treatment, seasonal conditions, and growth, F. M. STUBBLEFIELD and E. E. DeTURK. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 120-124, figs. 4).—It was found, in part, that percentages of the various elements tended to vary inversely with yields, while removal per acre varied directly with yields, except that potassium, reflecting the soil supply, increased in percentage on the plats supplied with crop residues, lime, rock phosphate, and potassium, coincident with larger yield. Weather conditions had a marked effect, crops grown on the same plat in succeeding years sometimes varying as much in chemical composition as crops grown on different plats. The maintenance of reasonably high producing capacity of soil thus tends to stabilize crop composition. Nitrogen and phosphorus are found primarily in the grain of the cereal crops, potassium and calcium in the straw, and magnesium and sulfur approximately equally distributed.

Relation of soil composition to plant and animal deficiencies (*Texas Sta. Rpt. 1941*, pp. 23-24).—Deficiencies in forage samples are reported upon by J. F. Fudge and G. S. Fraps. .

Response of young corn plants to inorganic phosphates differing in solubility.—I, The effect of phosphorus absorption from rock phosphate on the composition and dry weight of corn at three growing stages, S. R. DICKMAN and E. E. DeTURK. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 213-219, figs. 3).—Variations in the amount of coarse rock phosphate in a sub-irrigated substrate of quartz particles resulted in corresponding variations in the phosphorus composition of the plants at each of three samplings. The percentage of phosphorus in plants which utilized fine rock phosphate, however, was higher at the first sampling and lower at the second and third samplings than in those plants which utilized coarse rock phosphate. The greatest root increases during the first period were made by plants which utilized rock phosphate as the sole source of phosphorus, but at later stages the roots of plants which received continuous soluble phosphate made the greatest increases. A phosphorus limitation factor is obtained by dividing the dry weight increase per milligram of phosphorus absorbed by the soluble phosphate plants into the corresponding values of the rock phosphate plants, and serves as a relative index of the phosphorus level in the plant. Values greater than one indicate that phosphorus was deficient, while values less than one demonstrate that phosphorus was absorbed in excess of the ability of the plant to utilize it for dry weight production. In rock phosphated plants the phosphorus limitation factor was highest at the first sampling and then decreased regularly. This indicates an adjustment of the metabolism of the plant to the low phosphorus uptake. In those plants which utilized rock phosphate, the proportional decrease in phosphorus content during the second period was greatest in those which contained the highest percentage of phosphorus at the first sampling. This trend was reversed during the final period, and a critical percentage of phosphorus (0.137) at the second sampling was found, above which plants increased in phosphorus content during the final period, and below which they decreased. No quantity of rock phosphate was found capable of producing plants containing as high a

percentage of phosphorus as that of the plants which received 20 p. p. m. of soluble phosphate in the nutrient solution. Plants which grew on the highest rock phosphate treatment approached 0.17 percent phosphorus as the maximum, about half of that found in plants which received soluble phosphate and about half that found ordinarily in field-grown corn.

It is considered erroneous to judge responses to phosphates on the basis of dry weights or plant measurements only; phosphorus uptake must be determined and the percentage of phosphorus in the tissues considered before any general conclusions regarding phosphorus fertility can be drawn.

Phosphate fixation in soils—a critical review, A. R. MIDDLEY. (Univ. Vt.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 24-30).—The author analyzes and compares experimental results and findings of numerous investigators, drawing conclusions of which the following are a part:

Though there is experimental support for the view that phosphate ions may be fixed by replacing hydroxyl ions in the crystal lattice of bentonite and to a greater degree because of the presence of more replaceable hydroxyl groups, those of kaolinite, the author points out that it is difficult to distinguish such adsorption from chemical precipitation, especially in face of the fact that the crystal structure of kaolinite is known to be altered by its fixation of phosphate. The hydroxyl ion is quite effective in replacing or liberating adsorbed phosphate, but in some instances it is likely that the fixing complex was partly dissolved due to increased alkalinity. Liberation of fixed phosphate by the citrate ion also may be due to its dissolving effect since citric acid quite readily dissolves iron phosphate, and although silicates applied to phosphate-deficient soils have appeared to increase phosphate availability, the evidence thus far reviewed indicates that the silicate may dissolve rather than actually replace the native phosphate in soils. The author does not concur in the view that soluble iron and aluminum in acid soils are the main agents which render phosphate slowly soluble and difficultly available to plants for the reasons (1) that free iron and aluminum ions are not, except in very acid or alkaline soils, present in the soil solution in quantities such as to account for the speed at which fixation takes place, and (2) that freshly precipitated iron and aluminum phosphates are known to be quite readily available to plants. Slightly soluble and difficultly available phosphates may more probably be formed by union of the phosphate with undissolved hydrated oxides of iron and aluminum. Lack of phosphate availability in alkaline calcareous soils seems to be due to a carbonate-phosphate complex rather than simple tricalcium phosphate. Fluorophosphate or fluorapatite may also form under such conditions, because fluorine is apt to be present in underground waters of calcareous soils, and it reacts quite readily with tricalcium phosphate when alkaline to form fluorophosphate. Since superphosphate also contains active fluorine, care should be exercised in producing nonacid-forming fertilizers because fluorophosphate also forms under these conditions.

Availability of fixed potassium as influenced by freezing and thawing, L. O. FINE, T. A. BAILEY, and E. TRUOG. (Wis. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 183-186).—Net releases of as much as 150 lb. of potassium per acre (2,000,000 lb.) resulted from freezing and thawing treatment in about two-thirds of the soils studied. In some instances a fixation of potassium resulted, however, and in others no change was detected. The addition of lime tended to inhibit the release of fixed potassium upon freezing. Increasing the nonexchangeable potassium content of a Chico soil by a potassium fixation treatment caused a release of potassium upon freezing slightly greater than when the soil was not so treated. When subjected to the freezing treatment,

most of the clay minerals allowed the release of considerable proportions of the nonexchangeable potassium which they held as a result of fixation treatments, a fact considered to indicate that some of the soil minerals of high base-exchange capacity may be active in the release of nonexchangeable potassium in soils upon freezing. Illite, however, appeared to retain its nonexchangeable potassium despite the freezing treatment. The clay of Miami garden soil, containing much nonexchangeable potassium and consisting perhaps largely of illite, also tended to retain its nonexchangeable potassium when subjected to the freezing treatment. Carrington soil, of which the clay fraction appeared to consist of approximately 40 percent illite, showed the same tendency. Illite may be a mineral of which the exchangeable potassium becomes nonexchangeable during freezing.

The absorption of potassium in soils in non-replaceable forms, L. K. Wood and E. E. DeTurk. (Ill. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 152-161, figs. 3).—Dipotassium phosphate and potassium chloride were added at rates ranging from 0 to 9,775 p. p. m. to each of six Illinois soil types representing widely different stages in soil development. The extent and nature of the fixation of the added potassium was determined after 8-, 16-, 25-, and 52-week periods of moist contact at room temperature. Replaceable potassium was determined by leaching with ammonium acetate, with or without previous removal of the water-soluble potassium compounds by leaching with 60 percent methanol. Of potassium fixed by the soil, that held in an acid-soluble combination was extracted by boiling with normal nitric acid solution and the acid-insoluble fraction determined by difference. The potassium was precipitated as the cobaltinitrite (E. S. R., 81, p. 326) and titrated by a hexanitratammonium cerate method not yet published.

The three forms were found to be in a slowly shifting equilibrium with each other, equilibrium being reached after from 16 weeks to 1 yr., depending on the soil used and the amount of potassium added. Shifts in the equilibrium apparently occurred by the law of mass action, as increasing additions of soluble potassium caused increasing shifts to fixed forms. The native replaceable and acid-soluble potassium ranged from large to very small amounts in passing from young dark-colored soils to those in late stages of development. The capacity to fix potassium in acid-soluble form after additions decreased with increasing stage of development. The gains in acid-insoluble potassium following additions were more nearly uniform but not consistent. The more mature soils tended to reach equilibrium more quickly than the young soils. There was a tendency of the fixation to go beyond the equilibrium point, usually at 16 weeks, then to rebound to equilibrium. Previous fertilizer treatments in the field, including potassium applications for many years, had little effect on the reactions involved. The associated anion exerted a pronounced effect on the water-soluble-replaceable equilibrium, and it also affected the ratio of acid-soluble to acid-insoluble potassium. These relations were greatly modified by the nature of the soil, and the results gave some clues as to the nature of the reactions involved in potassium fixation.

It is pointed out that the fact that potassium fixation as it is found in Illinois soils is an equilibrium reaction is of great importance in the potash economy of soils. This investigation has made it evident that in many soils fixation is not an objectionable phenomenon from the farmer's standpoint, but rather that it is a means of conservation of added potassium by holding it in forms which are relatively insoluble, but which, being in equilibrium with the replaceable form, return to that form as it is depleted by growing crops. Other Illinois soils in

which potassium fixation is undoubtedly detrimental to crop utilization of potash fertilizers are known, however.

Calcium- and sulfate-ion concentrations in a soil receiving excess gypsum, as influenced by several factors, I. E. VANONI and J. P. CONRAD. (Univ. Calif.). (*Soil Sci.*, 53 (1942), No. 2, pp. 125-133, figs. 2).—The authors treated 2-kg. portions of soil, containing an excess of gypsum, with 1 l. each of distilled water alone, of three concentrations of CaCl_2 , and of five concentrations of K_2SO_4 . Each of the nine solutions was also allowed to remain in contact with an excess of gypsum alone. The effect of changing ionic strength on the solubility of gypsum was approximated by making 2:1 extracts from soils to which KCl solutions had been added. A comparison of the extracts of equivalent total anionic concentrations contained when calcium chloride, potassium sulfate, or potassium chloride was added indicated an approximately constant ion concentration product for gypsum in solutions of equal ionic strength and showed the effect of increasing ionic strength on the solubility of gypsum. To simulate the effect of biologically produced acids on the solubility of gypsum in soils, because of the calcium and other ions brought into solution, various concentrations of HCl were added to lots of soil containing an excess of gypsum. The effect of varying water content on a soil system containing a given amount of calcium chloride and an excess of gypsum was explored over a wide range of soil-water ratios.

The concentrations of Ca and SO_4 ions found were, within reasonable limits, explicable in terms of solubility-product and ionic-strength phenomena.

Boron in some Hawaiian soils and crops, T. TANADA and L. A. DEAN. (Hawaii Expt. Sta.). (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 2, pp. 65-74, fig. 1).—Distribution of total and water-soluble boron, the availability of water-soluble boron, and the fixation of boron in Hawaiian soils are considered in this article. Information is also given on the boron content of various agricultural crops.

Both the total and the water-soluble boron were found to be highest in surface soils—4 to 56 and 0.4 to 3.2 p. p. m., respectively. Old eroded soils from regions of heavy rainfall had the most total boron, but generally the soils with high total boron had a low water-soluble boron content. A normal crop of sugarcane was found to remove from the soil less than 0.5 lb. of boron per acre.

Are there possibilities in subsoil fertilization? R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 2, pp. 59-64).—Results of Mitscherlich tests are given for soil samples collected from areas where cooperative field tests were conducted. Samples were taken from each of two depths, i. e., from 0 to 12 in. designated as surface soil and from 12 to 24 in. as subsoil. Acknowledging the limitations of the method used, the author points out that without nitrogen or P_2O_5 or K_2O there was only one instance where the subsoils yielded as well as the surface soils, but that well-fertilized subsoils were made to produce yields which were not significantly different from similarly fertilized surface soils.

Using crop residues for soil defense, F. L. DULEY and J. C. RUSSEL. (Coop. Nebr. Expt. Sta.). (*U. S. Dept. Agr., Misc. Pub.* 494 (1942), pp. 16, figs. 27).—An illustrated publication on the utilization of crop residues as a means of conserving soil and water. Crop residues are defined to include materials such as stubble, straw or stalks from various crops, or even old weed growth. Adjustments and modifications of farm equipment to carry out the program for effective utilization of crop residues are described in detail. Data on the effect of the various treatments on soil and water losses and crop yields, soil moisture, and soil structure are given.

Filter-cake compost, J. P. MARTIN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 2, pp. 53-58, figs. 3).—Data are presented from

investigations to determine the rate of decomposition of filter cake under field and laboratory conditions and the nutritive value of filter cake compost. Filter cake is defined as a byproduct of sugar production and is the filtered residue obtained from clarifying raw cane juices.

AGRICULTURAL BOTANY

[Botanical studies by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 51, 81, fig. 1).—Brief reports of progress are given on work by D. I. Allen on the physiological causes of relative adaptations among soybean varieties, with special reference to mineral nutrition; and on photoperiod effects on lespedeza by G. E. Smith.

[Botanical studies by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1941, pp. 20–21, 21–23, 115–116).—Brief reports, by V. L. Cory, H. B. Parks, A. H. Alex, and C. E. Minarik, are included on studies of the adaptability of native plants, with special reference to those suspected of possible use for stabilization of blowing sand areas; plant survey of the State with special reference to economic usage; tests of canaigre and other plants for tannin; native vegetation in relation to the livestock industry, and miscellaneous physiological studies of rice.

Bibliography of the botany of New York State, 1751–1940, II, H. D. HOUSE (*N. Y. State Mus. Bul.* 329 (1942), pp. 175–233).—It was found necessary to publish additional titles (E. S. R., 86, p. 751), along with indexes to biographical citations, species, localities, and subjects mentioned, and an author index covering both parts. These matters are here presented.

A botanical survey of the upper Columbia River region, Washington, H. T. ROGERS (*Wash. State Col. Res. Studies*, 10 (1942), No. 2, pp. 99–140, fig. 1).—Following introductory remarks and general discussions of the topography, geology, and vegetation of the area, an annotated catalog arranged by plant families is presented.

Proceedings of the Eighth American Scientific Congress (8. *Amer. Sci. Cong., Washington, 1940, Proc., vol. 3, pp. 125–132, 135–192, 199–206, 223–242, 251–274, 277–278, 279–283, 287–294, pls. 15, figs. 6*).—The following papers are of interest to agricultural botany: The Life Forms and Flora of the North American Desert, by F. Shreve (pp. 125–132); Plant Tissue Cultures—A New Technique in Experimental Science, by P. R. White (pp. 135–142); Central and South American Potatoes for the Improvement of European and North American Stocks, by E. K. Balls (pp. 143–147); New Discoveries of Myriangiales in the Americas [10 new species of *Elsinoc* described], by A. A. Bitancourt and A. E. Jenkins (pp. 149–172) (U. S. D. A. et al.); Induced Evolution in Plants Through Chromosome Changes, by A. F. Blakeslee (p. 173); Los frutos de las especies silvestres de *Arachis* [The Fruits of Wild Species of *Arachis*], by A. Burkart (pp. 175–178); Pesquisas taxonômicas sobre os gêneros *Pseudananas* e *Ananas* [Taxonomic Study of the Genera *Pseudananas* and *Ananas*], by F. C. Camargo (pp. 179–192); Genetic Interpretations of Cultural Variations in the Fungi, by B. O. Dodge (pp. 199–206); Experimental Induction of Heritable and Other Alterations in the Fungus *Neurospora tetrasperma* (pp. 223–229), and The South American Genetic Groups of the Genus *Nicotiana* and Their Distribution (pp. 231–238), both by T. H. Goodspeed (Univ. Calif.); What the Study of the Green Plant Has Taught Us Concerning a Mechanism of Photosynthesis, by O. L. Inman (pp. 239–242); Cotton Breeding in Relation to Taxonomy, by T. H. Kearney (pp. 251–255) (U. S. D. A.); The Cultivation of Hevea Rubber in Tropical America, by W. E. Klippert (pp. 257–262); Mangosteen Cultivation, by W. R. Lindsay (pp. 263–265); The Origin of Maize, by P. C. Mangelsdorf (pp. 267–274); Vitamins as Growth Substances for Plants, by W. J. Robbins (pp. 277–278); The Presence

of *Azotobacter agilis* in North and South America, by S. Soriano (pp. 279-283); and Temperature Reaction, Mutation, and Geographical Distribution in Plant Groups, by O. E. White (pp. 287-294).

Reclaiming agar for bacteriological use, A. F. ROE (*Science*, 96 (1942), No. 2479, p. 23).—It is claimed that by the procedure briefly outlined a product may be obtained that is actually superior to the common commercial crude agar. When a sufficient quantity of waste agar for immediate processing is not available it may be dried and stored.

Reclamation of used agar, H. I. THALER. (U. S. D. A.). (*Science*, 96 (1942), No. 2479, pp. 23-24, fig. 1).—Using the method described, it is estimated that 75-80 percent of the waste agar is recovered, including the initial loss adherent to flasks in pouring. The product has been tested in other laboratories with over 30 different micro-organisms and the results have been reported as uniformly satisfactory.

Bacterial activity in dilute nutrient solutions, C. E. ZOBELL and C. W. GRANT. (Univ. Calif.). (*Science*, 96 (1942), No. 2486, p. 189).—As a result of studies summarized in this preliminary note, it is believed that under proper conditions concentrations of utilizable organic matter considerably smaller than 0.1 mg./l. will provide for bacterial multiplication. Solid surfaces seemed to facilitate assimilation of dilute nutrients.

The productions of two antibacterial substances, fumigacin and clavacin, S. A. WAKSMAN, E. S. HORNING, and E. L. SPENCER. (N. J. Expt. Stas.). (*Science*, 96 (1942), No. 2487, pp. 202-203).—In a study of the presence of antagonistic fungi in nature, more than 160 cultures with such properties were isolated from soils, manures, and composts and separated into nine groups on the basis of their taxonomic and physiologic relationships. Among them, two species producing active substances were studied in detail: Fumigacin, isolated from *Aspergillus fumigatus*, proved especially active against gram-positive bacteria, and clavacin, isolated from *A. clavatus*, was particularly active against gram-negative bacteria. Their properties are briefly described. Unlike most substances of this type, clavacin possesses high bactericidal as well as bacteriostatic activity.

The separation and characterization of carotenoid pigments produced from mineral oil by bacteria, H. F. HAAS, L. D. BUSHNELL, and W. J. PETERSON. (Kans. Expt. Sta.). (*Science*, 95 (1942), No. 2477, pp. 631-632).—A new adsorption technic was developed for the separation of petroleum-soluble carotenoids from mineral oil. Four carotenoids were separated as products of bacterial metabolism with mineral oil as the sole C source, and two of them possessed vitamin A potency. No xanthophylls were present, but one pigment was definitely shown to be astacin, a carotenoid found primarily in crustacea and not hitherto associated with bacterial metabolism.

Relation of maximum growth temperature to resistance to heat, C. LAM-ANNA. (Oreg. State Col.). *Jour. Bact.*, 44 (1942), No. 1, pp. 29-35).—Studying species of *Clostridium* and *Bacillus*, this paper presents experimental evidence suggesting a relation between the maximum growth temperature of a bacterial species and its capacity (including spores) to survive heat injury. Within the genus *Bacillus* three groups were separable with respect to spore resistance and relation to maximum growth temperature. The inexact correspondence of maximum growth temperature to thermal resistance of spores is believed to mean that factors in addition to those determining maximum temperature of growth are involved in thermal resistance. There are 20 references.

Bactericidal action of ultraviolet radiation on air-borne organisms, H. C. RENTSCHLER and R. NAGY (*Jour. Bact.*, 44 (1942), No. 1, pp. 85-94, figs. 5).—Through use of a specially devised tower arrangement, the sensitivity to ultra-

violet irradiation of air-borne bacteria and of similar organisms on the surface of agar was shown to be the same. Studies described also indicate that bacteria may be so injured by heat, Grenz rays, or X-rays that the surviving individuals are less resistant to such irradiation. This result is incompatible with the "single photon hit" theory. All bacteria in a pure strain of a culture are not identical, and the term k in the exponential equation generally used for expressing the survival ratio for different exposures to ultraviolet radiation is not as constant as commonly assumed. The air centrifuge, as used in determining the bacterial contamination of air moving through a duct at low humidity, is selective in taking the bacteria from the air. This appears to explain the reason for the general statements that air-borne bacteria at low humidity are more vulnerable to ultraviolet radiation than when on the surface of agar, and that at low relative humidity the bactericidal action is greater than for high humidity.

Some problems in fungus phylogeny, E. A. BESSEY. (Mich. State Col.). (*Mycologia*, 34 (1942), No. 4, pp. 355-379, figs. 5).—An address critically analyzing the subject, with 34 references.

Two cases of unusual development of fruit bodies, C. M. CHRISTENSEN. (Minn. Expt. Sta.). (*Mycologia*, 34 (1942), No. 4, pp. 400-402, figs. 3).—A note recording nongeotropic development of the agarics *Russula* sp. and *Daedalia confragosa*.

The mycorrhiza of *Zeuxine strateumatica*, J. N. PORTER (*Mycologia*, 34 (1942), No. 4, pp. 380-390, figs. 6).—*Rhizoctonia mucoroides* is shown to be the mycorrhizal associate of the orchid *Z. strateumatica* in Florida. Details of the study are presented.

Relationship of dissociation of cellular proteins by auxins to growth, H. T. NORTEN. (Univ. Wyo.). (*Bot. Gaz.*, 103 (1942), No. 4, pp. 668-683, fig. 1).—Using the centrifuge method of determining protoplasmic viscosity, and principally on cortex cells of bean petioles and stems, unilateral applications of growth substances were found initially to condition negative curvatures, in which cases the viscosity was lower in cells on the faster than on the slower growing sides and also lower than in controls. When subsequent positive curvatures resulted, the viscosity was decreased about equally on the treated and untreated sides, except for petioles treated with the lanolin paste at 100 mg. of indole-3-n-propionic acid per gram, where the viscosity was lower on the untreated sides. Applications of this acid or of α -naphthaleneacetic acid to the tops of decapitated plants resulted in a decrease in the structural viscosity of protoplasm in cells below the cut surfaces. These decreases were conditioned in part at least by dissociations of cellular proteins, i. e., by the splitting of proteins into molecules one-half, one-fourth, one-eighth, etc., that of the original ones. Biochemical and thermodynamical evidence introduced suggests that such dissociations condition increased protoplasmic swelling pressure, respiration, and polysaccharide hydrolysis, as well as altering development. There are 81 references.

Interrelation of organic materials in the growth substance response, S. C. BAUSOR (*Bot. Gaz.*, 103 (1942), No. 4, pp. 710-724, figs. 4).—Intact tomato seedlings and cuttings in a mineral nutrient kept in darkness during treatment produced only a small response to growth substances in 6 days and limited to slight enlargement of cells and increase in size of nuclei and nucleoli. The reaction was almost completely inhibited when the leaves were removed. Intact and defoliated cuttings cultured in sucrose, maltose, levulose, glucose, and lactose (but not mannitol) in darkness produced the complete response as in plants in the light. In cuttings left in darkness for 1-6 days before treatment, those in a sucrose nutrient showed no differences due to pretreatment, but those in the mineral nutrient alone showed progressively less response through the third

day and none at all beyond that time. Cuttings treated with lanolin paste for 3 days while in the mineral solution were then transferred to the sucrose medium. Six days later, when harvested, the treated regions had proliferated and produced root primordia. This response was not so great, however, as in cuttings cultured in sucrose but not treated until the time the minus-sucrose plants were put into the sugar solution. Bean cuttings in a mineral nutrient in the dark also showed decreased response to the growth substance and complete response when cultured in sucrose. Galactose proved toxic to both tomato and bean cuttings. Tomato cuttings in a minus-N medium responded as vigorously to the growth substances as did those without N. The most obvious cytological change in response to the growth substances in both plants was the great increase in size of nucleolus. Under carbohydrate deficiency the nucleolus diminished in size and finally disappeared. No changes occurred in the nucleoli of plants cultured in a sugar medium in the absence of growth substances. There are 34 references.

Auxin storage as related to endosperm type in maize, G. S. AVERY, JR., J. BERGER, and B. SHALUCHA (*Bot. Gaz.*, 103 (1942), No. 4, pp. 806-808).—From the experimental results presented it is believed clear that kernels of sweet corn are much richer in auxin than those with brittle, waxy, floury, or flinty endosperm. So far as could be determined, these are the first assays demonstrating markedly different auxin storage in ontogenetically identical tissues from different varieties of the same species.

A reversible growth inhibition of isolated tomato roots, J. BONNER (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 8, pp. 321-324).—Isolated roots of three different tomato clones were inhibited in growth by addition of sulfanilamide, sulfapyridine, or sulfathiazole to the nutrient medium. This effect was in whole or in part abolished by further addition of *p*-amino benzoic acid. Isolated roots of the clones used normally contain this acid or a substance with similar physiological activity.

Colchicine stimulation of seed germination in *Petunia axillaris*, L. BOND. (*Univ. Wis.*). (*Jour. Hered.*, 33 (1942), No. 5, pp. 200-201, fig. 1).—Treatment induced an increase in the number of seed germinating and a reduction in germination time. The optimum concentration (0.04 percent) for germination proved high enough to induce polyploidy. Seedling growth was seriously retarded only by concentrations of 0.1 percent or stronger, the concentrations most widely used in seed treatment. In view of these results, it seems that seed treatment by weaker solutions should yield satisfactory results in the practical production of large numbers of polyploid plants.

Occurrence of vitamins in fungi, C. C. CARPENTER and E. W. FRIEDLANDER (*Science*, 95 (1942), No. 2477, p. 625).—From results of the authors' studies and of investigations by others, it is deemed quite evident that the production of thiamin and riboflavin, and probably of other vitamins, is a normal function of the fungus group.

Vitamin synthesis by a yeast converted from a heterotrophic to an autotrophic habit, L. H. LEONIAN and V. G. LILLY. (W. Va. Expt. Sta.). (*Science*, 95 (1942), No. 2478, p. 658).—The authors succeeded in inducing 10 strains of *Saccharomyces cerevisiae*, generally considered heterotrophic for a number of vitamins, to grow without an outside supply of thiamin, pyridoxin, inositol, and pantothenic acid, and a rich growth without even biotin was induced in at least one strain. This building-up process of autotrophic habit was accomplished by prolonged incubation, use of a large amount of inoculum in initial stages, and successive transfers to solutions from which one of the essential vitamins had been omitted.

Physiological activity of ascorbic acid in plant life, E. F. KOHMAN and D. R. PORTER (*Science*, 95 (1942), No. 2476, pp. 608-609).—From experiments with potted young tomato plants it is concluded that the losses in ascorbic acid noted in fruits and vegetables in storage are not due entirely to oxidation by atmospheric O₂, but to its being used in some physiological process, the activity of which is diminished by severing the plant from the root system.

Synthesis of ascorbic acid in excised tomato roots, M. E. REID and W. J. ROBBINS (*Science*, 95 (1942), No. 2477, pp. 632-633).—The results reported suggest that vitamin C may play a much more important role in the economy of the plant than has previously been attributed to it.

A proteolytic enzyme in the latex of the weed *Euphorbia lathyris* (caper spurge), W. J. ELLIS and F. G. LENNOX (*Austral. Jour. Sci.*, 4 (1942), No. 6, pp. 187-188).

Apparatus for the production of artificial frost injury in the branches of living trees, R. A. STUDHALTER and W. S. GLOCK (*Science*, 96 (1942), No. 2485, p. 165, fig. 1).—Spontaneous late frost injuries have been used in the past to determine the presence of multiple growth rings in 1 yr. in the branches of living trees. To facilitate such studies, an apparatus was devised for producing artificial frost injury under controlled conditions which is said to have certain advantages over types previously developed and to have a temperature range of 0° to -45° C. over intervals up to 7 hr. Described and illustrated in detail, it consists essentially of a lid, dry-ice chamber, and treatment chamber, all of wood insulated by cork on the interior and by aluminum paint on the exterior.

Effect of chemical treatments in prolonging dormancy of tung buds, H. M. SELL, W. REUTHER, E. G. FISHER, and F. S. LA GASSE. (U. S. D. A.). (*Bot. Gaz.*, 103 (1942), No. 4, pp. 788-793, figs. 2).—One of the most important problems of the tung industry is the injury to the flowers by late spring frosts. This study concerned the effects in prolonging dormancy of certain organic compounds (α -naphthaleneacetic acid and its K salt, indole-3-acetic acid, and α -naphthaleneacetamide in various carriers). The data obtained indicated a pronounced effect of the treatments in delaying bud development. It is possible that some practical application of these preliminary results may develop from future studies.

The rooting of flowers in sterile culture, C. D. LA RUE (*Bul. Torrey Bot. Club*, 69 (1942), No. 5, pp. 332-341, figs. 5).—Tests for regeneration were made on nutrient agar for flowers of 12 species of monocotyledons in 9 genera of 3 families, and of 80 species in 74 genera of 34 families of dicotyledons. Roots were produced on flowers of various members of both groups, and the results are detailed. It is concluded that the apparent lack of regeneration in flowers is due to their short life, their position which does not allow them contact with moist substrata, and their lack of food supply. The conditions needed for their regeneration were supplied by placing them in sterile culture on nutrient agar. Besides supplying moisture and food, the culture conditions prolonged the life of the flowers to an extraordinary degree and allowed them time for regeneration. There are 19 references.

Studies on the embryo of *Hordeum sativum*.—II, **The growth of the embryo in culture**, J. MERRY (*Bul. Torrey Bot. Club*, 69 (1942), No. 5, pp. 360-372, figs. 6).—In continuation (E. S. R., 86, p. 606), it was found that when embryos 7-8 days old were cultured on a nutrient agar medium no changes were apparent, when cultured at 9 days all the cells enlarged and no cell division occurred, at 10-11 days some cell division took place but eventually all the cells stopped dividing and enlarged, and at 12 days or older the cells in certain regions continued to divide as long as the plants were grown, while the cells in other

regions enlarged at once or divided for a short time and then enlarged. No cell division and only slight cell enlargement was noted in the scutellum of cultured embryos. The size of the stem meristem was about the same in all plants from embryos 12 days old or more. Leaf primordia were formed more rapidly, and the coleoptile and leaves were larger in plants from older embryos. The ratio of size of coleoptile, leaves, and roots of cultured plants to size of these parts in normal embryos increased rapidly with age of embryo for early ages but soon decreased with an increase in embryo age. The vascular bundles became lignified sooner and to a greater extent in plants from older embryos. The primary root was longest in plants from embryos 14–16 days old and was successively shorter in plants from progressively older embryos. Only as many seminal roots as were already differentiated in the embryo grew in culture, other roots formed being adventitious on the stem. There are 16 references.

Behavior of woody desert legumes at the wilting percentage of the soil, R. F. DAUBENMIRE and H. E. CHARTER. (Univ. Idaho). (*Bot. Gaz.*, 103 (1492), No. 4, pp. 762–770, figs. 3).—The wilting percentage of the soil had essentially the same significance in the water relations of *Prosopis velutina*, *Acacia farnesiana*, and *Lysiloma thornberi* as in wheat. In contrast to wheat, attainment of the wilting percentage in these legumes was not marked by a wilting of the leaf blades but brought about an essentially concomitant increase in abscission rate, deviation from normal diurnal positions of pinnales, cessation of shoot elongation, and sharp decrease in transpiration rate. It appeared that the growth and transpiration rates of the legumes continued at about normal levels as long as the soil contained water in excess of the wilting percentage. Wherever the legume roots had access to growth water, their transpiration rates appeared to be closely related to the strength of illumination and to be unrelated to variations in the evaporative power of the air, so long as the latter was not likewise controlled principally by insolation.

Withdrawal of water from the fruit by the leaves of cotton, V. A. NOVIKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 32 (1941), No. 4, pp. 288–290).—Results of the four tests reported appear to indicate that water is drawn from the bolls on wilting of the plant and that the main part of it is absorbed by the leaves. The bolls of Egyptian cotton, containing more water than American varieties, suffered less from dehydration. The fact that upland cotton has a tendency toward forming the abscission layer in the peduncle is explained partly on the basis of a high water loss from the bolls when the leaves are in need of it.

Theory of porometers used in the study of stomatal movements in leaves, H. L. PENMAN (*Roy. Soc. [London], Proc., Ser. B*, 130 (1942), No. 861, pp. 416–434, figs. 4).—The mathematical theory of porometers for studying stomatal movements in leaves is given for viscous and diffusive flow of gases. It is shown that under certain circumstances the theory applies to both kinds of gas movements, and a correction is made for those cases in which the basic assumptions for diffusion are not realized. From determinations of the total leaf resistance to gaseous flow the conductance of the stomata can be found if the mesophyll resistance is known. The importance of this quantity is discussed and demonstrated, methods of measuring it are suggested, and possible checks on the reliability of the results are described. As an illustration, the theory is applied to some new data on two pelargonium leaves, the treatment giving results that were internally consistent and deduced assimilation rates being of the same order of magnitude as those observed in practice.

Identification of selenium indicator species of *Astragalus* by germination tests. S. F. TRELEASE (*Science*, 95 (1942), No. 2478, pp. 656-657).—The simple germination test described, based on the observation that a Se indicator species tolerates and is even stimulated by a high concentration of Na_2SeO_4 , whereas a nonindicator species is severely poisoned by a low concentration, was found to agree with the results of field data and growth experiments of longer duration. The study included 25 *Astragalus* species.

Rubber analysis of plants in South Carolina. J. H. MITCHELL, M. A. RICE, and D. B. RODERICK. (Clemson Agr. Col.). (*Science*, 95 (1942), No. 2477, pp. 624-625).—Chemical analyses as to rubber content are presented for 34 species.

Carbohydrate nutrition of *Rhizopus suinus*. C. J. CORUM (*Bot. Gaz.* 108 (1942), No. 4, pp. 740-750, fig. 1).—Extraction of dextrose, levulose, galactose, and sucrose with acetone, alcohol, and ether resulted in increased mycelial production. Extraction of dextrose with alcohol and ether also resulted in increased mycelial production but the increase was not so great as by the preceding method. Recrystallization of dextrose from 80 percent alcohol resulted in about the same growth increase as from the acetone-alcohol-ether treatment. Presence of vitamin B₁ in reagent-grade dextrose was shown by the thiochrome oxidation method. Removal of traces of this vitamin from sugars during extraction was possibly the cause of the growth phenomena obtained. The dextrose extract contained a substance which, when concentrated by evaporation and added to the medium, promoted vegetative growth of *R. suinus*. Under the extraction conditions, removal of vitamin B₁ would be more extensive than removal of the ash, the influence of this vitamin removal being more effective in increasing the fungus growth than removal of the small amount of ash in decreasing its growth. However, when the extract was concentrated the influence of the ash on mycelial production was much greater than that of the vitamin, with the resulting increase in growth. There are 14 references.

Carbohydrate metabolism in wheats under conditions of insufficient soil moisture. K. G. MIROSHNICHENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 32 (1941), No. 1, pp. 81-84).—The carbohydrate metabolism under deficient moisture was followed throughout the growth cycle of a drought-resistant and a drought-susceptible variety of wheat. At whatever developmental phase the drought was brought to bear, the yields were adversely affected.

Some effects of nitrogen on young apple trees. B. F. LUTMAN (*Vermont Sta. Bul.* 488 (1942), pp. 35, pls. 4, figs. 15).—Young McIntosh and Northern Spy apple trees were fertilized with either relatively large or small amounts of sodium nitrate in an attempt to determine possible relations between N applications and foliage susceptibility to scab. Shoots in the high-N trees lengthened much more rapidly than did those on low-N trees during the first 6 yr. of growth, but less so later. This increased growth was accompanied by the formation of a larger pith, thus making the shoots on high-N trees soft and fleshy and more readily open to scab infection. Leaves from both sets of trees were very stable as to size of cells, nuclei, and chloroplasts, although those grown on the high-N trees were thicker and larger. No differences were noted in cuticle thickness. Chemical analyses showed higher percentages of organic N in leaves of the high-N trees. Little pruning had been done and the foliage of the well-fed trees was relatively large and dense, and during three summers humidity averaged higher and temperature lower in their foliage than in that of the low-fed trees. Periods of high humidity and low temperature were accompanied by scab outbreaks which were much more severe on the well-fed than on the less well-fed trees. Leaves on the higher-N trees were apt to remain green all summer, whereas they

were likely to turn a yellow-green in early August on the low-N trees. Chloroplasts in the leaves of the high-N trees remained large and active, whereas those from leaves of the low-N trees tended to disintegrate in the upper palisade layers. Small globules, staining intensely, filled the cells of the upper row of palisade cells as the chloroplasts and nuclei disappeared, and were especially noticeable in the less well-fed trees. These bodies began to appear almost as soon as the leaves were grown. The one or more sterols (nature undetermined) extracted from the yellowing leaves appeared to be byproducts of plastid activity and may possibly injure the leaf cells. These globules when located in the upper layer of palisade cells may be of advantage, since they interpose a yellow layer which diffuses and filters out some of the sunlight's ultraviolet rays, enabling underlying cells the better to survive and function.

Studies in tropical fruits.—XII, The respiration of bananas during storage at 53° F. and ripening at controlled temperatures, E. R. LEONARD and C. W. WARDLAW (*Ann. Bot. [London], n. ser., 5 (1941), No. 19, pp. 379-423, figs. 26*).—The respiration of individual banana fruits of standard commercial grades during storage at 53° F. and ripening at controlled temperatures (65° and 68°) was investigated by methods yielding data on respiration rates, internal concentrations of CO₂ and O₂, and the CO₂ content of the tissues. Detailed results are presented and discussed in relation to the findings of other investigators for other fruits, such as apples and pears, and consideration is also given to the significance of the readjustments of internal concentrations of CO₂ and O₂ which take place on transferring fruit from tropical temperatures to 53° and their relation to the development of abnormal ripening trends (e. g., in chilled fruit). There are 19 references. See also a previous note (E. S. R., 87, p. 63).

Photoperiodic after-effects in six composites, V. A. GREULACH (*Bot. Gaz., 103 (1942), No. 4, pp. 698-709, figs. 5*).—Photoperiodic aftereffects were observed in two short-day plants (*Cosmos bipinnatus* and *C. sulphureus*) and four long-day species (*Rudbeckia hirta*, *Matricaria parthenoides*, *Centaurea cyanus*, and *Coreopsis tinctoria*), and the detailed results are reported.

Effects of photoperiod on sex expression in *Ambrosia trifida*, L. K. MANN. (Univ. Calif.). (*Bot. Gaz., 103 (1942), No. 4, pp. 780-787, figs. 5*).—This short-day plant, after starting growth on long day, was subjected to 2, 10, and 20 photoinductive cycles at each of the 3 photoperiods 15, 12, and 6 hr., following which the plants were returned to long day to complete growth. The rate of maturity was most rapid and fruit yield greatest in plants exposed to 20 photoinductive cycles at the 12-hr. period. Sex expression as measured by development of pistillate flowers in the position usually occupied by staminate ones increased with the increasing number of photoinductive cycles and decreasing lengths of photoperiod, being greatest in plants exposed to 20 cycles at the 6-hr period.

Some effects of radiant energy in relation to etiolation, J. P. BIEBEL (*Plant Physiol., 17 (1942), No. 3, pp. 377-396, figs. 3*).—The morphological response of kidney bean seedlings increased at a receding rate with increases in incident radiant energy, but the amount of response varied with the manner in which the energy was increased. High irradiances caused more response than the low, even when the total radiant energy incident on the plants was the same. The maximum morphological response followed irradiation 2-3 times daily, and chlorophyll formation increased with the number of cycles of irradiation up to 144 times daily. Albino corn seedlings gave the same morphological response to irradiation as normal green seedlings. The Q₁₀ of the "light reaction" was apparently unity. Temperature at time of irradiation did not in itself affect the magnitude of response. All plant parts were able to act to some extent as preceptors of radiant energy, and adjacent nonirradiated parts responded

to some degree when any part was irradiated, but the leaves and especially the growing point were the most sensitive perceptrors. No effect was observed when an irradiated bean seedling was grafted to a nonirradiated one, provided neither was irradiated thereafter. Ether extracts of hypocotyls of irradiated and nonirradiated bean seedlings each had about the same amount of auxin per hypocotyl, but the irradiated hypocotyls were smaller and the auxin concentration in them was higher. There are 13 references.

Stimulation of yeast respiration by ultraviolet radiations, A. C. GIESE (*Jour. Cell. and Compar. Physiol.*, 20 (1942), No. 1, pp. 35-46, figs. 8).—With age or aeration, the endogenous respiration of yeast cultures declines. Irradiation of cultures with low endogenous respiration in the presence of small amounts of nutrients or none resulted in an increase in respiratory rate which continued for several hours. Similar cultures to which excess glucose had been added before irradiation exhibited a lower respiratory rate than controls. Cultures of *Achromobacter fischeri* aerated until they had a low rate of endogenous metabolism also showed an increased respiratory rate after irradiation, but lower than in yeast. No evidence for a similar stimulation was observed in sea urchin sperm, in a protozoan (*Tetrachymena*), or in the mycelium of *Neurospora*. The author suggests explanations of the increase of endogenous respiration and the decrease of exogenous (saturated) metabolism in yeast following irradiation.

Symposium on growth and differentiation in plants (*Amer. Nat.*, 76 (1942), No. 764, pp. 225-279).—The following are included: Regeneration, Development, and Genotype, by C. E. Allen (pp. 225-238) (Univ. Wis.); Induced Chromosomal Changes and Their Significance in Growth and Development, by J. M. Beal (pp. 239-252); The Problem of Internal Differentiation in Plants, by E. W. Sinnott (pp. 253-268); and Effects of Growth-Regulating Substances on Mobilization and Development, by J. W. Mitchell (pp. 269-279) (U. S. D. A.).

The cytology of some wild species of *Hordeum*, T. C. CHIN (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 19, pp. 535-545, figs. 14).—This is a taxonomic and cytological study of six wild species of *Hordeum*.

Intermittent growth of fruits of *Cypripedium* and *Paphiopedilum*: A correlation of the growth of orchid fruits with their internal development, R. E. DUNCAN and J. T. CURTIS. (Univ. Wis.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 5, pp. 353-359, figs. 5).—The ovaries of both orchid groups studied possessed two phases of growth in diameter and one in length. The first phase of growth in diameter and that of growth in length occurred while the ovules were maturing prior to fertilization. The second phase of growth in diameter took place while the embryos were growing most rapidly. Fertilization occurred at a time when growth of the ovary had almost ceased.

Eccentric growth in the main stem of young white ash trees, G. P. BURNS (*Vermont Sta. Bul.* 492 (1942), pp. 19, pls. 2, figs. 7).—Regardless of mechanical forces, eccentric growth in white ash stems without side branches was found to be due to excessive cell division of the cambium on the upper side. The fibers were always shortest on the lower and longest on the upper side, and the cell walls, especially fibers, were thicker in cells on the upper than on the lower side. No evidence appears to indicate that compression or tension acted as a stimulus to cell division. In stems bent one way only the most rapid cell division occurred at the point where a very pronounced bending took place. This was not found on the compression or tension but on the so-called neutral sides. Differences in structure of the two sides consisted chiefly in the formation of additional mechanical tissue on the upper side. When a lateral bud develops

near the top of a bent stem the most rapid cell division may be shifted from the upper to the lateral side. When lateral buds on a bent stem developed there was a marked tendency to suppress all morphologically apical buds, including the terminal bud.

GENETICS

[Genetic and physiological studies by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 20, 23-24, 25-28, 33-34, 36-37, 38-39, 40-42, 44-45, 74).—Results are briefly reported by R. Bogart, L. A. Weaver, F. F. McKenzie, F. N. Andrews, D. T. Mayer, J. F. Lasley, W. K. Dinwiddie, H. L. Cooksey, J. E. Parker, C. W. Turner, O. B. Houchin, J. Meltes, S. Holst, A. J. Bergman, H. A. Herman, N. P. Ralston, A. A. Lewis, J. P. Mixner, A. C. Ragsdale, C. W. McIntyre, P. T. Cupps, S. Brody, C. F. Winchester, H. H. Kibler, M. J. Regan, W. Gifford, and E. M. Funk of a study of inheritance in swine by breed colors and morphological conditions; inbreeding and improvement of swine through breeding methods; oestrous, ovulation, and related phenomena in the mare; the induction of ovulation in the mare; purification of the gonadotropic hormone in pregnant mare serum; relation of psychological and physiological conditions in the oestrous cycle to the oestrin content of the follicular fluid in urine of the mare; the induction of oestrous and ovulation in the ewe; an artificial vagina for swine; swine, rabbit, and poultry semen collection and storage; the fat metabolism hormone of the pituitary of the rabbit; extraction of lactogen from urine; the lactogen content of the anterior pituitary of the growing rabbit and guinea pig; bird and rabbit response to lactogenic hormone; effect of thyroxine on milk and fat production of dairy cows and goats; mammogen content of pituitary of cattle and other animals; development through breeding of a high producing strain of Jersey cattle; the extraction and separation of certain anterior pituitary hormones; comparison of the guinea and the chick thyroid in the assay of thyrotropic hormone; the thyrotropic hormone in the pituitary of the rat; seasonal rhythms in livestock; artificial insemination of dairy cows; semen examination for indication of fertility in dairy bulls; line-breeding Holstein and Jersey herds; and the relation of size of clutch and position of the egg in the clutch to hatching results.

Some mendelian characters in *Beta vulgaris* and linkages observed in the Y-R-B group, F. V. OWEN and G. K. RYSER. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 3, pp. 155-171, figs. 7).—Linkage relationships of 10 mendelian factors in *B. vulgaris* are reported on, with brief descriptions of the characters represented, including *B*, bolting or annual habit; *bl*, black root; *Cl*, colored leaf; *Cv*, colored leaf veins; *pl*, plantainlike leaf venation; *R*, red plant color; *ru*, russet root; *Tr*, trout or spotted leaf; *vi*, variegated foliage; and *Y*, heavy production and extension of pigment. The sequence and approximate genetic spacing of the seven genes in the Y-R-B linkage group were found to be Y 8 R 4 *Cl* (*Cl* 0 ? *Tr* 0 ? *Cv*) *Cv* 12 B 10 *vi*. *Cl*, *Cv*, and *Tr* were very closely linked and their order was not determined. Available data suggest that *bl*, *pl*, and *ru* are not in the Y-R-B group. A variegated foliage condition with large albino sectors was observed, and the type of progeny obtained from albino and green sectors gave evidence of maternal or cytoplasmic inheritance.

A photoperiodism accompanying autotetraploidy, J. G. O'MARA. (U. S. D. A. and Mo. Expt. Sta.). (*Amer. Nat.*, 76 (1942), No. 765, pp. 386-393).—"Autotetraploid *Secale cereale* reacted to short days in a manner different from that of the diploid strain from which it was derived. The diploid was fertile throughout the year; the autotetraploid was female sterile under the natural short days of December and January. This photoperiodism constitutes another

instance of a character present in an autotetraploid which is apparently unpredictable from the parental diploid." There are 24 references.

Frequency of induced chlorophyll mutations in diploid and tetraploid barley. A. MÜNTZING (*Hereditas*, 28 (1942), No. 1-2, pp. 217-221).—This is a cytogenetic study of X-irradiated barley seed, with special reference to the frequent occurrence of chlorophyll mutations in the diploids and their absence in the tetraploids of the X³ generation. The detailed results presented are believed to suggest strongly that most of the induced mutations were associated with or caused by structural chromosome alterations.

The relation of mitotic disturbances to X-ray dosage and polyploidy. K. FRÖIER, A. GUSTAFSSON, and O. TEDIN (*Hereditas*, 28 (1942), No. 1-2, pp. 165-170).—Statistical analysis of mitotic disturbances induced in dormant seed of oats and four species of wheat indicated that diploid, tetraploid, and hexaploid species respond to increasing X-ray dosages by damage differing for each of the three groups of polyploidy. Curves for the single diploid and two tetraploids examined deviated significantly from a straight-line proportionality, whereas no deviation therefrom could be proved for the hexaploids. Whether the sigmoid and the straight-line curves differ fundamentally could not be ascertained, but it is believed that the damage curves of the hexaploids are only flattened sigmoid curves. Instances of straight-line proportionality, inferred from genetic and cytologic experiments, must be reinvestigated with special attention to low-dosage regions (e. g., with respect to X-chromosome lethals to dosages between 50 and 800 r.).

Studies on the meiotic mechanism of haploid rye. A. LEVAN (*Hereditas*, 28 (1942), No. 1-2, pp. 177-211, figs. 5).—A detailed cytological study, with 45 references.

[**Animal genetic investigations by the Texas Station**]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1941*, pp. 76, 80-82, 90, 152-154).—Progress reports of studies with livestock are briefly reported from the Texas Station by J. N. Thompson, R. M. Sherwood, G. R. Fuller, B. L. Warwick, R. D. Turk, R. O. Berry, H. Schmidt, S. P. Davis, J. C. Miller, P. B. Dunkle, J. M. Jones, W. H. Dameron, J. H. Quisenberry, F. Hale, H. C. McPhee, and D. A. Spencer, which deal with strain differences in turkeys; resistance of lambs to stomach worms and of mice to loin disease and other pathogens; cytological studies of crosses between sheep and goats; inheritance of fiber characteristics of Rambouillet and Romney sheep and crosses between them; transference of genes for fineness of fiber from non-Angora to Angora goats; selection for polled character in fine wool sheep; inheritance of skin folds on Rambouillet sheep and type in Angora goats; and relationship of genetic factors in inbred rats to vitamin A requirements.

Vitamin C—For sterility in farm animals. P. H. PHILLIPS (*Holstein-Friesian World*, 39 (1942), No. 7, pp. 369-370, fig. 1).—Improvement in breeding and fertility of cows and bulls was brought about by ascorbic acid administration.

Coat color inheritance in bull terriers. L. C. BRIGGS and N. KALISS. (Cornell Univ.). (*Jour. Hered.*, 33 (1942), No. 6, pp. 223-228, fig. 1). An analysis of the colors of parents and progeny of 1,974 bull terriers produced by breeders all over the world led to the conclusion that brindle was controlled by a single pair of genes dominant to nonbrindle and white was controlled by multiple recessive factors in their entirety, while red was recessive to other colors except white. Fawn, black-and-tan, and tricolor were in disfavor and therefore the data too meager for interpretation. Only 6 of 49 matings of brindle × brindle produced all brindle pups and 6 matings in 52 brindle × red gave entirely brindle litters, which is within the expectation of heterozygous parents. White × white matings gave only white pups. In 1,303 litters the sex ratio was 127 ♂s to 100 ♀s, which is a nonsignificant departure from expectation.

"Ataxia", a hereditary nervous disorder of the rabbit, P. B. SAWIN, M. V. ANDERS, and R. B. JOHNSON (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 4, pp. 123-127).—A degenerative disorder of the nervous system of rabbits designated as ataxia was found to be caused by a recessive mendelian factor (*at*). There was a posterior paralysis at 58-89 days of age which became progressively worse, with death before sexual maturity. The condition was perpetuated by the progeny of heterozygous parents. There were produced under such conditions 219 individuals, of which 55 showed the condition. The genetic hypothesis was supported and not disproven in outcrosses of heterozygotes with other strains.

Two hermaphroditic rats, R. O. GREEP (*Anat. Rec.*, 83 (1942), No. 1, pp. 121-128, pls. 2).—The anatomy of these hermaphroditic rats is described.

Factors influencing lung lobation in the mouse.—I, Genetic factors: A preliminary report, S. BROWDER (*Anat. Rec.*, 83 (1942), No. 1, pp. 31-39, figs. 9).—Nine distinct lung patterns were observed in eight sublimes of mice as a result of prolonged inbreeding. The lung patterns were studied on autopsy of from 15 to 71 individuals in the different families.

Stub, a new mutation in the mouse with marked effects on the spinal column, L. C. DUNN and S. GLUECKSOHN-SCHOENHEIMER (*Jour. Hered.*, 33 (1942), No. 6, pp. 235-239, figs. 3).—A recessive characteristic designated as stub (*sb*) was found in inbred mice in which the tails were frequently shortened and the entire vertebral column was in such disorder that the numbers of vertebrae could not be ascertained. The numbers of ribs were reduced and fused. From heterozygous normal matings there were produced 54 stubs and 209 normals. The deviation from expectation was not significant and until birth viability was considered normal. Most stub homozygotes die before 1 mo. of age, but three litters were produced by stub ♂s and heterozygous ♀s. "Preliminary tests indicate that *sb* is probably not an allele of the following tail mutations: brachy (*T*), king (*Ki*), fused (*Fu*), lethals *t*^o and *t*['], flexed (*N*), twisted (*tw*), shaker short (*st*), and screw (*sc*)."

Studies of spotting patterns.—V, Further analysis of minor spotting genes in the house mouse, L. C. DUNN (*Genetics*, 27 (1942), No. 2, pp. 258-267).—Continuing this series (E. S. R., 80, p. 750), an attempt was made by 10-12 generations' inbreeding by brother and sister matings to separate some of the constituent elements from the *k* complex. Inbred lines and sublimes proved to be quite similar in range of white spotting, although there were variations in the model grade from 6 to 10 percent dorsal white in one family to 21-25 percent in another. It is considered that the spotting was nongenetic since the variations persisted even to the thirteenth generation. Crosses and backcrosses of *k* spotted whites with self-colored dilute brown mice showed the *k* complex of white spotting to differ from self by a complex of mutant genes with minor effects. One or more was dominant and others recessive, with all interacting additively. Four inbred lines derived from different parts of the F₁ population from crossing *k* spotted and self mice differed in that two showed *k* spotting, one showed tail spotting only, and one showed no spotting. Evidently the no spotting race contained mutant spotting alleles since crosses with spotted mice produced spotting.

An analysis of data on X-ray-induced visible gene mutations in *Drosophila melanogaster*, H. C. FRYER and J. W. GOWEN. (Iowa Expt. Sta. coop. Kans. State Col.). (*Genetics*, 27 (1942), No. 2, pp. 212-227).—Studies were made of the influence of three wave lengths of two doses with each wave length at 19 specific gene loci on three chromosomes of ♂s at 24 hr. or less of age from five inbred lines. The data analyzed by the χ^2 test showed that the mutation rate

was proportional to the dosage, but that for a particular gene and a fixed dosage the wave length of the X-ray does not affect the mutation rate. The fundamental rates of mutation on the chromosomes are the same if the sets of genes are representative of their respective groupings of the chromosomes. The genes within the sets observed did not appear to have the same basic mutation rates. Analysis of mutation data reported by other authors substantiated these conclusions.

The relative effect of environment and heredity upon body measurements and production characteristics in poultry.—I, **Period of growth**, H. S. GUTTERIDGE and J. B. O'NEIL (*Sci. Agr.*, 22 (1942), No. 6, pp. 378-389, fig. 1).—From study of the variance in body measurements and weights at four weekly intervals from 4 to 24 weeks of age for Barred Plymouth Rock cockerels, hatched at three locations and raised at the same locations and at each of the other localities, it was concluded that environment had a greater effect than heredity upon the course of growth and conformation. Fleshing characteristics indicated by fullness of breast and circumference of tibia were even more markedly affected by environment, but as maturity approached the influence of heritable factors was more apparent.

Crossbreeding and heterosis in turkeys, V. S. ASMUNDSON. (Univ. Calif.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 311-316, fig. 1).—The mean weights of ♂ and ♀ turkeys from hatching to 32 weeks of age of White, Black-winged Bronze, Black, Bourbon Red, and Lilac varieties and crosses between them indicated the effects of heterosis which were more pronounced at different ages and in certain crosses. F₁ Black × White, or Black-winged Bronze, exceeded the weights of the Black strain at all ages but did not differ significantly from the weights of the larger parental strain. F₁s of Black × Bourbon Red and Lilac exceeded both parents in weight by the time they were 8 weeks of age and thereafter. Coefficients of variation showed the F₁s to be more uniform than the parents. The numbers of each sex included in the tabulation of the strains and crossbreds ranged from 5 to 28 birds. Males were heavier and grew more rapidly than ♀s.

Immunogenetic studies of species: Segregation of serum components in backcross individuals, R. W. CUMLEY and M. R. IRWIN. (Univ. Wis.). (*Genetics*, 27 (1942), No. 2, pp. 177-192, fig. 1).—Carrying further the immunogenetic studies of the Pearlneck and ringdove pigeons and crosses and backcrosses between them (E. S. R., 86, p. 614), the species hybrid was shown to have all or nearly all of the species-specific and common components of both parents. A segregation of those specific to Pearlneck was produced by successive backcrosses to the ringdoves in four families. All backcross individuals were descendants of a single Pearlneck ♂ and therefore the possibility of cytoplasmic influence on the serum constituents was ruled out.

Immunogenetic studies of species: Qualitative differences in the serum of backcross progeny following a generic cross in birds, M. R. IRWIN and R. W. CUMLEY. (Wis. Expt. Sta.). (*Genetics*, 27 (1942), No. 2, pp. 228-237, fig. 1).—Following methods employed in the above studies, interactions of various antisera against sera of pigeons, ringdoves, and species hybrids between them indicated that at least part of the antigens peculiar to the pigeon are present in the hybrid. The serum of the species hybrids contains nearly all of the antigens of the pigeon serum, and variations between the hybrids are assumed to result from the heterozygosity of the pigeon parents. Likewise the ringdove antiserum contains antibodies for species-specific antigens of both F₁ and ringdove serum. It thus becomes apparent that without great quantitative refinement the serum of the F₁ is indistinguishable from and possibly identical with the serum of the

ringdove. After absorption of the F_1 antiserum with both parental sera there was no evidence of a hybrid substance remaining, but backcrosses gave evidence that genes may influence the chemical constitution of proteins.

On the incidence of the breeding season in mammals after transference to a new latitude, DUKE OF BEDFORD and F. H. A. MARSHALL (*Roy. Soc. [London] Proc., Ser. B*, 130 (1942), No. 861, pp. 396-399).—Attention is called to the rapid changes in the breeding season in carnivores when moved to the southern hemisphere. On the other hand, ruminants which do not have fixed breeding seasons and other animals inhabiting tropical areas do not react to the seasonal influence of light.

Oogenesis in adult mice and starlings, W. S. BULLOUGH and H. F. GIBBS (*Nature [London]*, 148 (1941), No. 3754, pp. 439-440).—The presence of oogenesis in the adult mouse and starling ovaries was demonstrated. Mitoses were cyclic in the mouse and seasonal in the starling.

Effect of the gonadotropic substance of pregnant mare's serum on the blood plasma-ascorbic acid of the castrate bovine, F. N. ANDREWS and R. E. EBB. (Ind. Expt. Sta.). (*Endocrinology*, 30 (1942), No. 5, pp. 671-674, fig. 1).—Decreases of 42 and 56 percent, respectively, in venous blood plasma-ascorbic acid levels of steers were induced within 5 hr. by injection of 1,000 and 2,000 rat units of equine gonadotropin in pregnant mare serum. Recovery to preinjection levels of plasma-ascorbic acid occurred in 44 and 68 hr. following injections periods. The study was conducted by chemical analysis for ascorbic acid from blood from 14 steers before and at periodic intervals after injection of the hormone.

Effects of hypophysectomy at mid-pregnancy in the mouse, W. U. GARDNER and E. ALLEN (*Anat. Rec.*, 83 (1942), No. 1, pp. 75-97, pls. 3, figs. 2).—Sixteen of 19 ♀ mice hypophysectomized at mid-pregnancy carried their litters to term and in most cases had normal parturition at the expected time. The follicles destined for post partum ovulation had the hypophyses not been removed were easily identified, but the ovaries were much smaller and less vascular and the follicles devoid or deficient in liquor folliculi. The corpora lutea remaining from the previous litter were normally developed. It thus seems evident that the regulation of the gonadal function of the hypophysis must be altered during pregnancy. Effects on the adrenal gland, development of the mammary glands, and birth mechanisms receive special comment.

Action of vasopressin and oxytocin in causing premature oviposition by domestic fowl, W. H. BURROWS and R. M. FRAPS. (U. S. D. A.). (*Endocrinology*, 30 (1942), No. 5, pp. 702-705, fig. 1).—Continuing work by Burrows and Byerly (*E. S. R.*, 84, p. 510), studies of the premature production of hard-shelled eggs by hens with hard-shelled eggs in their uteri indicated that the yields between about 30 and 90 percent could be estimated by the formula $y = a + b \log x$, where y is the percentage yield, x is the dose of pitocin and pitressin intravenously administered, and a and b are constants. Premature oviposition can apparently be effected by vasopressin alone, but oxytocin appears also to contribute to the reaction.

Gonadotropins of the swine pituitary, I-III (*Endocrinology*, 30 (1942), No. 5, pp. 635-661, figs. 36).—Three papers in this series are presented.

I. Various biological effects of purified thyliakentrin (FSH) and pure metakentrin (ICSH), R. O. GREEP, H. B. van DYKE, and B. F. CHOW (pp. 635-649).—Injection of metakentrin (*E. S. R.*, 84, p. 609) from swine into hypophysectomized immature ♂ rats caused growth of accessory organs due to stimulation of testicular cells but hypophysectomized castrates showed no glandular growth. Large doses were needed to stimulate immature ♂ pigeons. When given to immature hypophysectomized ♀ rats in conjunction with thyliakentrin it brought

about corpus luteum formation. Ability of the two hormones to induce ovulation in oestrous did not seem to differ greatly. Sheep and hog sources were about equally effective on the prostate although certain quantitative differences in causing ovulation were found.

II. *Preparation and biological and physico-chemical characterization of a protein apparently identical with metakentrin (ICSH)*, B. F. CHOW, H. B. VAN DYKE, R. O. GREEP, A. ROTHEN, and T. SHEDLOVSKY (pp. 650-656).—Electrophoretic analysis showed the metakentrin prepared from hog pituitaries to be a homogeneous substance but differing in isoelectric point from metakentrin isolated from sheep pituitaries.

III. *Immunological specificity of swine metakentrin*, B. F. CHOW (pp. 657-661).—Immunological studies of ICSH isolated from hog pituitary stimulated in rabbits the formation of species specific antibodies demonstrable by the precipitin and complement fixation reactions. The hog metakentrin antiserum did not react with ICSH from sheep or beef. Both lobe and hormone specificity were demonstrated.

Increase in gonadotropic content of pituitary glands of female rats treated with antigonadotropic serum, R. K. MEYER, H. S. KUPPERMAN, and J. C. FINERTY. (Univ. Wis.). (*Endocrinology*, 30 (1942), No. 5, pp. 662-666).—Treatment of immature and adult rats for 63 and 54 days with antigonadotropic serum from rabbits which have been treated 2 mo. or more with an aqueous extract of sheep pituitary glands caused the gonadotropic potency of the hypophysis to be like that of the castrates and exceeded normals accordingly. The size of the gonads was reduced by antigonadotropic treatment, but after 19 days' cessation of treatment recovery was essentially normal.

Responses of the testis to androgenic treatments, C. R. MOORE and C. F. MORGAN (*Endocrinology*, 30 (1942), No. 6, pp. 990-999, *figs.* 5).—The testes of the opossum were shown to increase from the sixteenth to sixtieth day after birth and more slowly from the eighty-third day to maturity. Treatments of 1 of each pair of 11 controls with testosterone or testosterone propionate failed to produce consistent modifications. The study was made by comparing the weights of the larger organs and planimeter readings of the smaller ones as a result of the treatment.

The effects of postnatal androgenic treatment in the female rat, R. R. GREENE, M. W. BURRILL, and A. C. IVY (*Anat. Rec.*, 83 (1942), No. 1, pp. 19-29, *pls.* 2).—Differences in the interpretation to the response of the gonads of young ♀ rats treated subcutaneously with testosterone as given by Selye (*E. S. R.*, 84, p. 461) were pointed out. The uteri were stimulated in the author's animals and remained atrophic in Selye's studies, which may be accounted for by strain differences.

Comparison of methods for standardization of pituitary interstitial-cell-stimulating hormone (ICSH), M. E. SIMPSON, C. H. LI, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 30 (1942), No. 6, pp. 977-984, *figs.* 9).—Comparison of different assay methods for ICSH showed that the most sensitive response was obtained by increases in weight of the pigeon testis for which 0.030 mg. gave an effective response. The ventral prostate of hypophysectomized rats was responsive to 0.05-0.1 mg. and the chick testis least sensitive, 0.5 mg. being required.

Biological properties of pituitary interstitial-cell-stimulating hormone (ICSH), M. E. SIMPSON, C. H. LI, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 30 (1942), No. 6, pp. 969-976, *figs.* 4).—Studies of ICSH with normal and hypophysectomized ♀ rats showed that the dioestrous interval was prolonged with increases in weight of the ovaries in normal but not in hypophysec-

tomized animals. Placentoma formed about threads installed in the uteri of normal animals. Pregnancy was prolonged and birth of living young prevented by ISCH in normal pregnant animals. Some repair of the testes and spermatogenesis was maintained by ISCH in hypophsectomized δ s. The studies were conducted with groups of about five rats treated daily for 10 days with 1 mg. of hormone. In one test the effectiveness of ICSH on the ovaries of normal rats was destroyed by 4 hours' heating.

Transformation of males to intersexes by estrogen passed from blood of ring doves to their ovarian eggs, O. RIDDLE and H. H. DUNHAM (*Endocrinology*, 30 (1942), No. 6, pp. 959-968, pls. 2, fig. 1).—Histological study of the gonads of δ embryos of ringdoves showed that the left testis of δ embryos from eggs laid by females treated with oestradiol benzoate about the day before ova were released from the ovary showed a temporary development of ovarian cortex which persisted until hatching in 13 of 17 cases and disappeared quickly thereafter. Normal Mullerian ducts were inconspicuous and negligible at and after hatching. Genetic females remained definitely of this sex. Dehydroandrosterone which was weak in oestrogen activity had little effect. The results resembled those of injecting oestrogens into the incubating egg, thus showing the direct transfer of oestrogens from the ovaries of the hen to the egg.

The estrogens, E. A. DOISY (*Endocrinology*, 30 (1942), No. 6, pp. 933-941).—The oestrogens are designated with the source, chemical composition, and richness of each.

Effects of estrogens upon the young of injected lactating rats, C. K. WEICHERT and S. KERRIGAN (*Endocrinology*, 30 (1942), No. 5, pp. 741-752, figs. 30).—Although rats nursing dams to which daily doses of oestrogens were administered failed to grow after 5 or 6 days there appeared to be no loss in milk secretion. There was loss of maternal instinct and a tendency for the dams to neglect the young. The study was conducted with 15 rats having their litters reduced at parturition to 3 δ s and 3 females each. Doses of 0.025-0.5 mg. of theelin or 0.025-0.1 mg. of diethylstilboestrol were injected daily. The influence on the urogenital system, although variable with young of the two sexes, seemed proportional to the dose of the oestrogen administered, but diethylstilboestrol was more effective than theelin.

The experimental control of prolonged pregnancy in the lactating rat by means of estrogen, C. K. WEICHERT (*Anat. Rec.*, 83 (1942), No. 1, pp. 1-17, pls. 2).—Continuing these studies (*E. S. R.*, 84, p. 318), it was shown that the gestation periods of pregnant lactating rats suckling 9 young varied from 27 to 40 days with the majority between 32 and 35 days. There was only a general correlation between the time of implantation and the number of young suckled. Injections of oestrogen in oil into 123 inseminated female rats suckling 9 young each permitted normal gestation through the control of normal implantation. Oestrogens necessary for normal implantation may be removed through mothers' milk when a litter is suckled.

FIELD CROPS

[Findings in field crops research in Arkansas]. (Partly coop. U. S. D. A.). (*Arkansas Sta. Bul.* 417 (1942), pp. 7-9, 15-17, 18-20, 26-28, 29-30, figs. 2).—Recent findings in agronomic research (*E. S. R.*, 84, p. 612) at the station and substations and their application to agricultural problems in Arkansas are reported on winter legumes for soil improvement, by R. P. Bartholomew; plant food requirements for cotton, by C. H. Wadleigh and W. H. Tharp; fertilization for rice production, by L. C. Kapp; development of hybrid corn for Arkansas, by L. M. Humphrey and C. K. McClelland; value of sorghums for feed and food,

by McClelland; and breeding for winter resistance in oats, by H. R. Rosen, L. M. Weetman, and McClelland.

[**Farm crops research in Mississippi**] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 8, pp. 1-2, 2-3, 5, 7).—Results from experiments with field crops are reported in articles entitled *Varieties and Kinds of Winter Legumes*, by R. Coleman (pp. 1, 7); *Increased Winter Legumes, To Plow Under, Suggested To Meet Nitrogen Shortage*, by C. Dorman (pp. 1, 3, 5); *Small Grain Varieties*, Hill Stations, by J. F. O'Kelly (pp. 1, 2); *Oat Variety Tests, Rates and Dates of Seeding* (pp. 1, 2, 3), and *Wheat and Barley Varieties* (pp. 1, 3), both by P. W. Gull; and *Fertilizing Oats in the Yazoo-Mississippi Delta*, by R. Kuykendall (pp. 1, 3).

[**Crops experiments in Missouri**]. (Partly coop. U. S. D. A.). (*Missouri Sta. Bul.* 444 (1942), pp. 19, 20, 50-51, 51-61, 79-80).—Field crops studies (E. S. R., 87, p. 52) reported on again by M. M. Jones, L. E. Hightower, R. P. Beasley, B. M. King, J. M. Poehlman, E. M. Brown, C. A. Helm, C. M. Tucker, L. J. Stadler, G. F. Craig, D. C. Anderson, J. G. O'Mara, E. R. Sears, L. Smith, G. F. Sprague, G. E. Smith, and W. A. Albrecht included breeding work with corn, wheat, oats for immunity or resistance to smuts, barley, and soybeans; genetic studies with corn, especially on the production of genetic variations by radiation of pollen with ultraviolet (E. S. R., 87, p. 203) and X-rays; polyploidy studies with wheat (E. S. R., 87, p. 207); variety trials with corn (and hybrids), barley, soybeans, oats, and cotton; effect of fertilizers on the yield and feeding value of timothy; fertilizer placement experiments and efficiency of tillage methods in growing corn; effect of treatment of seed corn on yield; pasture research, including response of Kentucky and Canada bluegrasses, orchard grass, and redtop in growth of roots, rhizomes, and herbage to variations in cutting height and in soil and air temperatures; influence of continuous, rotation, and supplemented (Korean lespedeza) grazing on live-weight gains by beef cattle on bluegrass pasture; pasture fertilization; and rotation pastures v. cultivated crops in production of feed for cattle.

[**Agronomic experiments in Nebraska**]. (Partly coop. U. S. D. A. et al.). (*Nebraska Sta. Rpt.* [1941], pp. 12-31, 34-36, 43-45, 79-81, 85-87, figs. 2).—Field crops research (E. S. R., 86, p. 33) reported on from the station and substations by T. A. Kiesselbach, L. M. Camp, K. S. Quisenberry, W. E. Lyness, R. L. Cushing, H. M. Tysdal, S. Garver, J. M. Slatensek, L. C. Newell, E. C. Conrad, T. E. Brinegar, F. D. Keim, N. S. Hanson, H. O. Werner, R. W. Goss, E. B. Snyder, E. Kneen, J. E. Livingston, L. L. Zook, O. J. Webster, and L. Harris included variety tests with winter and spring wheat, corn and hybrids, oats, barley, flax, grain sorghums, sorgo, alfalfa, sweetclover, soybeans, potatoes, castor-beans, Jerusalem-artichokes, and safflower; breeding work with corn (and hybrids), sorghum, wheat, oats, barley, soybeans, alfalfa (E. S. R., 87, p. 662), sweetclover, brome-grass, and potatoes; crop rotations; response of corn, wheat, and sorghum to fallow and other tillage practices; the influence of manure, alfalfa, and pastured sweetclover on yields of sugar beets, potatoes, and other irrigated crops; pasturing alfalfa with hogs and sweetclover with sheep and harvesting corn with hogs in these rotations; heat and drought endurance studies with potatoes; effect of different humidity and temperatures at various periods of the year in storage in relation to weight loss, rotting, and initiation of sprouting of potatoes; planting tests with wheat, oats, barley, and sorghum; cutting and palatability tests and coumarin determination with sweetclover; cold resistance of wheat, rye, and barley as affected by different factors; the influence of environmental factors and disease on the carbohydrate-enzyme relations in germinating grain; improvement of permanent pastures and meadows, including tests of strains of brome-grass and other grasses, selection and breeding with

bromegrass and other species, methods of producing grass seed and seed yields, response of grasses to intensity of clipping, a study of three methods of grazing sheep on bromegrass-alfalfa pastures, the grazing preferences by cattle and sheep for different species and strains of grasses, and range studies in sand hill and hard land areas; and studies on carbohydrate reserves in the roots of bindweed and bindweed control by cultivation, smother crops, and sodium chlorate and other chemicals.

[Agronomic investigations in Texas]. (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt. 1941*, pp. 8-19, 58-64, 96-99, 101-103, 108-109, 112-114, 116-117, 118-120, 124-130, 130-133, 134-135, 135-137, 138-139, 140-141, 147-150, 151-152, 154, 155, 156, 165, 166-168, 168-170, 170-172, 177-178).—Experimentation with field crops and related lines (E. S. R., 86, p. 180) at the station and substations is reported on briefly by E. B. Reynolds, R. H. Stansel, P. R. Johnson, H. F. Morris, D. T. Killough, J. E. Roberts, R. H. Wyche, H. M. Beachell, E. S. McFadden, C. H. McDowell, C. H. Rogers, R. G. Reeves, H. P. Smith, D. L. Jones, M. H. Byrom, R. L. Hensel, G. S. Fraps, J. H. Jones, W. H. Brittingham, D. A. Reid, J. O. Beasley, T. R. Richmond, K. F. Manke, I. P. Trotter, H. E. Rea, R. E. Karper, J. R. Quinby, J. C. Stephens, I. M. Atkins, P. B. Dunkle, R. E. Dickson, W. F. Turner, W. H. Dameron, V. L. Cory, J. F. Wood, W. H. Friend, G. H. Godfrey, L. E. Brooks, and E. Mortensen.

The research comprised variety tests with cotton, corn (and corn and sweet corn hybrids), wheat, oats for grain and winter pasture, barley, rice, grain sorghum, sorgo, broomcorn, flax, soybeans, edible soybeans, alfalfa, clover, sweetclover, vetch, potatoes, sweetpotatoes, sugar beets, castor-beans, and miscellaneous winter and summer legumes and grasses; a production test with safflower; flax as a winter crop for south Texas; breeding work with cotton, wheat, oats, barley, corn and hybrids, rice, grain sorghum, sorgo, sweetpotatoes, Sudan grass, cowpeas, sweetclover, peanuts, and buffalo and other grasses; development of cotton varieties adapted to mechanical harvesting; cytogenetics of cotton; inheritance studies with cotton, corn, and different sorghums; studies of the genetic and cytological relationship of corn, *Euchlaena*, and *Tripsacum*; cultural (including planting) tests with cotton, corn, wheat, oats, rice, grain sorghum, potatoes, buffalo grass, flax, safflower, castor-beans, soybeans, sweetclover, and winter legumes; a variety-spacing test with grain sorghum; size of plants, height of bed, date of planting, spacing, rooted v. cut slips, cover crop, cultivation, and harvesting tests with sweetpotatoes; root initiation by seedlings from cottonseed treated with growth-promoting substances; seedbed preparation studies; comparisons of corn and sorghums and their effects on succeeding crops; effect of different types of tillage preparation for wheat with relation to wind erosion; double cropping experiments with sorghum; curing of combined sorghum grain in trenches; irrigation tests with cotton, grain sorghum, safflower, and sugar beets; rotation and sequence experiments with different field crops and green manures; legumes interplanted with oats for hay; effect of gypsum, S, and subsoiling on forage yields; fertilizer tests with crops in rotation, cotton, corn, oats, rice, potatoes, sweetpotatoes, grain sorghum, peanuts, winter legumes, and pasture; methods of applying fertilizers and carriers of N and P for rice; tolerance of rice to different soil reactions; residual effect of cotton burs and manure for cotton; vetch and other green manures for cotton and other crops; soil fertility and improvement studies; rotation grazing, spraying, shading with other plants, and pulling in control of bitterweed; control of mesquite and pasture weeds; production and germination of buffalo grass seed and establishment of buffalo grass pasture; effects of fertilizer treatments on yield and chemical and botanical composition of herbage; relation of sunlight to the yield and quality of vegetation; and grazing tests with new grasses.

Basis for judging subalpine grassland ranges of Oregon and Washington, G. D. PICKFORD and E. H. REID (*U. S. Dept. Agr. Cir. 655* (1942), pp. 38, figs. 19).—Results of studies on subalpine grassland areas in eastern Oregon in 1937 and 1938 are summarized as a basis for judging the condition and use of such range. Two important range types found on subalpine grasslands in eastern Oregon and Washington were involved—the green fescue type and the needlegrass-weed type. The characteristics of this range in different condition stages are presented with comparative values for grazing, watershed, and protection of soil from accelerated erosion. Means for field identification of condition stages, trends of range condition, and current proper utilization are also described. The circular is expected to be of value to those using this type of range and of interest to other stockmen and others concerned with range vegetation and soils.

Cultivated grasses and legumes in Alaska (*Alaska Univ. Ext. Cir. 2* (1942), pp. [4], fig. 1).—That native grasses will not survive when cut or grazed year after year was shown by experiments of the Alaska Experiment Station. They mature early and quickly lose their feed value and palatability by leaching. Legumes seeded on established grass mixtures have given best results, while those sown alone, except the yellow-blossom Siberian alfalfa (*Medicago falcata*), have seldom survived longer than two or three winters. Varieties of cultivated grasses and legumes found best adapted to the different areas are mentioned. Mixtures of grasses have produced heaviest yields. Grass meadows have responded to applications of 200 lb. of N fertilizer per acre with doubled yield, and legumes have responded equally well to treble superphosphate. Manure, 10 tons per acre, will increase hay or pasture yields about 30 percent. Where pastures or hay land become sod-bound, use of the cutaway disk or spring-tooth harrow will give excellent results. Seed may be either drilled or broadcast on well-prepared soil, preferably cultipacked before and after seeding.

Influence of soil temperature on the development of colonial bent grass, I. H. STUCKEY. (R. I. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 1, pp. 116–122, figs. 5).—Colonial bent, Kentucky bluegrass, and timothy seedlings, when grown for 6 weeks in tanks of nutrient solution with the roots at 45°, 60°, and 90° F. and the tops at one temperature, showed striking differences in development. Colonial bents grown for 5.5 mo. in soil with the roots at 50°, 60°, and 80° showed like differences. Root growth closely resembled that found out of doors when the soil temperature approximated the experimental temperature. Maturation of roots, accelerated by high soil temperatures, occurred before extensive ramification of roots took place in plants growing at the highest temperature. Death of plants at the highest temperature was attributed to early maturation and death of the root system.

Winter legumes for green manure in the Cotton Belt, R. MCKEE and A. D. MCNAIR (*U. S. Dept. Agr., Farmers' Bul. 1663, rev.* (1942), pp. 11+20, figs. 7).—This is a revision (*E. S. R.*, 65, p. 223).

Growing winter barley in New Jersey, C. S. GARRISON (*New Jersey Stas. Cir. 447* (1942), pp. 4).—Practical information is given on the soil and fertility needs of winter barley, varieties, seeding and planting, harvesting and use of feed, companion crop, and fall or spring pasture. Maryland Smooth Awn, Kentucky No. 1, and Tennessee Winter have made satisfactory yields. Nassau, a new variety recently developed at the station and to be released for general distribution in 1943, is a high-yielding, smooth-awn, stiff-straw, early-maturing, six-row winter barley.

Effects of artificially drying seed cotton on certain quality elements of cottonseed in storage, R. A. RUSCA and F. L. GERDES (*U. S. Dept. Agr. Cir. 651* (1942), pp. 19, figs. 4).—A 2-yr. study of wet and dry cottonseed of the 1939 and 1940 crops, handled to simulate oil-mill and cotton-gin storage conditions, re-

vealed that the process of artificially drying seed cotton at the gins has a beneficial effect on the storage qualities of the seed. Seed moisture content and temperature were decreased by the drying process with the result that development of free fatty acids was definitely retarded. Viability was increased slightly. A free fatty acid content of 2 percent was shown to be critical insofar as germination is concerned.

Potato growing on the Cumberland Plateau, J. J. BIRD (*Tennessee Sta. Bul. 181 (1942), pp. 66, figs. 22*).—Practical recommendations on potato production as to soils, rotations, varieties, seed and planting, seed production, fertilizers, control of diseases and insects by spraying, cultivation, harvesting, and storage are based on cooperative experiments, 1936-40, on 27 farms near Crossville.

Some of the better practices indicated by the experiments included use of the Chippewa, Pontiac, Sequoia, and Sebago varieties; seed of known origin; green sprouting of seed; use of a cutting table; blocky seed pieces weighing 1.5-2 oz.; planting between April 1 and 10; use of one-row potato planter; spacing 12 in. or less in the row or 8 in. apart when leafhopper and early blight are controlled with bordeaux; 1,000 lb. per acre of 4-10-4 fertilizer under average conditions on relatively old land, or 2,000 lb. with adequate spraying; combination of spray and fertilizer; use of the weeder to reduce row cultivations; harvesting by the use of a standard elevator digger, a low rubber-tired wagon, and crates; and sawdust-insulated above-ground storage.

Power-sprayed bordeaux mixture controlled early and late blight and hopper-burn effectively when applied weekly, while hand spraying or dusting proved unsatisfactory. The four-row engine-mounted, team-drawn sprayer was the most practicable for the average commercial acreage. Proprietary copper compounds failed to equal bordeaux in disease and insect control. Seven bordeaux sprays increased yields about 40 percent whether yields were high or low. Soil packing and damage to plants by sprayer wheels reduced yields considerably. Potato diseases and insects commonly found on the plateau are listed with characteristics and control measures.

Study of production costs and income on 12 farms in 1939 having average salable yields of 130 bu. per acre revealed an average labor income of 16.5 ct. per hour of man labor and yields averaging 170 bu. salable 44 ct. per hour. About three-fourths of the labor was expended in planting and harvesting when special equipment was not available. Effects of residual fertilizer on subsequent crops may be evaluated as part of the returns from the potato enterprise.

Interrelationship of storage temperature, concentration, and time in the effect of carbon dioxide upon the sugar content of potato tubers, F. E. DENNY and N. C. THORNTON (*Contrib. Boyce Thompson Inst., 12 (1942), No. 5, pp. 361-373, figs. 3*).—Tubers were stored at 2°, 5°, and 7° C. in atmospheres containing 0, 5, and 20 percent CO₂ and 21 percent O₂, and at 30, 60 and 90 days samples were removed for determinations of the reducing sugar and sucrose contents of the juice and for preparation of potato chips. The rapid increase of reducing sugar in tubers stored at 2° was inhibited for 30 days by 5 percent CO₂, and for 60 days by 20 percent CO₂, but after 90 days the values for CO₂-treated lots were one-half to one-sixth of those for the controls (without CO₂). At 5° the reducing sugar increase was prevented by 5 percent CO₂ for 90 days with Irish Cobbler and for 30 days with Katahdin varieties; with Green Mountain the 5 percent CO₂ values were kept down to about one-half those of the controls. A retarding effect of 5 percent CO₂ was also noted at 7°. Treatment with 20 percent CO₂, though exerting a retarding effect for 30 days at 5° and 7°, then had the reverse effect, so that in 90 days at 5° the

reducing sugar values were equal to the controls, and at 7° were three to five times those receiving no CO₂. Changing the temperature from 2° to 7° reversed the effect of 20 percent CO₂ on reducing sugar content. The general effect of CO₂ on sucrose content was to increase it greatly (about sixfold at 5° and 7°). At 2°, treatment with CO₂ first retarded sucrose increase as compared with the untreated, and then greatly increased it. Part of this anomalous effect is said to be due to the fact that the temporary maximum (formed in the sucrose curve of the juice from untreated tubers after about 30 days at 2°) does not occur in the presence of suitable amounts of CO₂.

Soybeans in brief: A war crop for Delta farmers, P. S. McCOMAS and E. L. LANGSFORD. (Coop. Miss. Expt. Sta. et al.). (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1942, *F. M.* 28, pp. [2]+11).—This report on soybeans for oil in the Mississippi Delta area "summarizes the experience of 50 farmers who have produced soybeans for oil, the results of experiment station work, and the opinions of experiment station and extension service workers."

Irrigation of sugar beets grown for seed, C. PRICE and M. R. HUBERTY. (Coop. Calif. Expt. Sta.). (*U. S. Dept. Agr. Cir.* 658 (1942), pp. 7).—Irrigation experiments with sugar beets grown for seed in the Hemet Valley of California were made during five seasons. When adequate moisture was supplied during blooming, irrigation at 7-day intervals gave no better results in yield and percentage of seed germinating than water at 14- and 21-day intervals.

Juice quality affected by lodging, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 2, pp. 39-42, fig. 1).—Cultures in which 31-1380 sugarcane was grown upright and in a horizontal or lodged position provided data showing that lodging, generally caused by heavy winds or rains, results in a poorer quality and an actual loss of sugar especially in that part of the stalk which remains recumbent. Apparently these effects from lodging were not altered by increased N fertilization.

Growing tobacco as a source of nicotine, J. E. McMURTRY, JR., C. W. BACON and D. READY. (Coop. 11 State expt. stas. et al.). (*U. S. Dept. Agr., Tech. Bul.* 820 (1942), pp. 39, figs. 10).—Comprehensive studies, 1934-38, were concerned with the nicotine production of different species and varieties of tobacco, effects of irrigation, and variations in planting and harvesting dates, topping, suckering, and spacing; and direct field planting, a sucker crop from a single planting, and distribution of nicotine in different plant organs. Inheritance studies have been noted (*E. S. R.*, 86, p. 458).

Under favorable conditions *Nicotiana rustica* consistently produced more nicotine than ordinary tobacco. On fertile soils under irrigation over a period of years its consistent yield was 150 lb. or more of nicotine per acre, about double the quantity from ordinary tobacco. Of numerous varieties or strains of *N. rustica* tested, Brasilia appeared to be the most satisfactory variety currently available. A new strain designated as 68 (Winnebago × Brasilia) has better growth habits than Brasilia but does not always yield more nicotine. For high yields of nicotine stunting of *N. rustica* plants at any growth stage must be avoided, topping and suckering done at regular intervals, and the crop as a rule harvested late, up to 60 days after topping, provided no excessive loss of lower leaves by leaf spot or drying occurs. The leaf was found to contain the bulk of the nicotine, but *N. rustica* stalks contained enough to justify their use for nicotine recovery. Temporary drought during growth constituted an important weather hazard in most humid regions. New disease and insect hazards in growing this crop were found in certain areas outside of the present tobacco-producing regions.

"As the problem now stands, growing high-nicotine tobaccos solely for their nicotine content apparently is feasible but does not offer a wide margin of profit on the basis of prices now paid for byproduct leaf. Commercial development would depend upon information obtained from more definite cost studies in both the producing and manufacturing phases of the problem. Development of higher yielding strains possessing desirable growth habits seems to furnish the most promising outlook for increasing the output per acre of nicotine."

Approximate hours of man labor (271) and horse work (90) needed for producing an acre of *N. rustica* tobacco and their distribution between the main cultural operations are estimated on the basis of requirements for growing burley and dark-fired tobacco in Kentucky (E. S. R., 57, p. 479).

Recent work on germination (*Nature* [London], 149 (1942), No. 3789, pp. 658-659, fig. 1).—A brief review of recent studies on seed germination, including references to some hitherto unpublished data.

HORTICULTURE

Effects of synthetic growth substances on cuttings, seeds, and transplants, J. C. SWARTLEY and L. C. CHADWICK (*Ohio Sta. Bimo. Bul.* 217 (1942), pp. 125-144).—Herein are discussed the results of treatments of various plants with synthetic growth substances. The treatment of leafy cuttings of woody plants was markedly beneficial in 8 of 17 species. The response was shown in a quicker production of a greater number of roots. In only one case (*Pyracantha coccinea pauciflora*) did rooting occur all along the stem instead of the usual location just above the thorns. Amide compounds compared favorably with the acid compounds but, in general, the latter were more effective provided they were used in the proper concentration. Synthetic growth substances adjusted to a pH of 3 acted in somewhat the same manner as did stronger concentrations. Acid mixtures proved particularly effective with fall cuttings of the Pfizer juniper but were for the most part toxic with winter and spring cuttings of the same species. Talc alone apparently was beneficial in some tests with Pfizer juniper and Japanese yew. Bottom heat at 80°-85° F. was detrimental. Treatments of seeds of various perennials gave increased germination, and in some cases the plants grown from treated seeds were larger at 2.5 mo. Treatment accelerated the growth of rooted cuttings of *Lonicera fragrantissima*, crabapple seedlings, coreopsis, viola, aster, tomato, and certain other species.

Plant-growth regulators, J. W. MITCHELL and R. R. RICE (*U. S. Dept. Agr., Misc. Pub.* 495 [1942], pp. [2]+75, figs. 10).—Information is presented on the history of the discovery of the function of growth-regulating substances, their preparation and use in various forms, methods of treating cuttings, and their use in controlling preharvest dropping of fruits and in transplanting. In tabular form, the results of trials by Department and other workers on the propagation of a large number of different plants are summarized.

[Horticultural studies by the Arkansas Station] (*Arkansas Sta. Bul.* 417 (1942), pp. 12-13, 25, 28-29).—Progress of the following studies is discussed: The canning quality of different peach varieties, by H. Reynolds and J. R. Cooper; the effect of lime on the growth and production of various vegetables, by V. M. Watts and Cooper; and the effect of fertilization and pruning on flower development and structure in the strawberry and cucumber, and the nature and causes of winter injury and hardness in brambles, both by J. E. Valle.

[Horticultural studies by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 64-65, 66-70).—Progress reports are presented on the following studies: The nutrition of vegetable crops and the influence of soil temperature

on the growth of cucumbers, both by R. A. Schroeder; the control of apple scab, correctives for reducing spray injury, and the nutrition of grapes, all by H. G. Swartwout; substitutes for lead arsenate, by C. G. Vinson; the propagation of forest trees and shrubs, site requirements and growth rate of native and exotic trees, and Christmas trees as a farm crop, all by R. H. Peck; control of biennial bearing in the apple by defoliation with various chemicals, by A. E. Murneek and Swartwout; performance of apple branches of various ages on both pruned and unpruned trees, by Murneek and D. G. White; effect of branch ringing on the set and size of fruit, and a comparison of spring and fall fertilization of apple trees, both by Murneek; induction of flower bud formation in young apple trees, by Murneek and W. H. Griggs; methods of determining carbohydrates in plant tissues, by Murneek and P. H. Heinze; and the effect of flower-producing hormones on the initiation of flower-buds in various plants, by Murneek and E. J. Airola.

[Horticultural studies by the Nebraska Station] (*Nebraska Sta. Rpt.* [1941], pp. 31-34, 36, 82).—Included are reports upon the effect of the November 11, 1940, freeze on fruit plants, the effect the naphthaleneacetic acid in promoting parthenocarp in the Dunlap strawberry, and soil management in the orchard, all by C. C. Wiggans and R. E. Baker; the use of supplemental water for orchards in eastern Nebraska, by Wiggans, Baker, and E. E. Brackett; the effect of sodium thiocyanate upon the coloring of Duchess apples, by Baker and E. H. Hoppert; relation of hardy rootstocks to tree injury during the November blizzard, by Baker; and tomato breeding, carrot breeding and improvement, irrigation and mulching of vegetables, and variety studies with vegetables, all by H. O. Werner. A brief report is given on the effects of the November freeze on fruit and shelterbelt plants at the North Platte Substation, by H. A. McComb.

[Horticultural studies by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1941, pp. 46-56, 57, 58, 99, 103-104, 109-110, 117, 137, 139, 141-142, 160, 161-162, 162-163, 164, 165, 166, 172-174, 174-177, 178-180).—In this current report (E. S. R., 86, p. 189), there are presented brief progress statements on variety, adaptability, culture, fertilizer, pruning, propagation, pollination, breeding, and other studies with vegetables, fruits and their products, nuts, ornamentals, and slash pine, and other plants at the main station, substations, and field laboratories by S. H. Yarnell, J. F. Rosborough, J. C. Ratsek, B. S. Pickett, T. E. Denman, U. A. Randolph, H. F. Morris, E. Mortensen, W. H. Friend, J. F. Wood, H. M. Reed, W. S. Flory, Jr., [M. L.] Tomes, L. R. Hawthorn, F. R. Brison, [H. T.] Blackhurst, R. A. Hall, E. M. Neal, R. H. Wyche, R. M. Sherwood, D. L. Jones, and J. J. Bayles.

Effects of partial defoliation at transplanting time on subsequent growth and yield of lettuce, cauliflower, celery, peppers, and onions, J. E. KRAUS (*U. S. Dept. Agr., Tech. Bul.* 829 (1942), pp. 35, figs. 5).—"Pruning" or partial defoliation was without significant effect on survival of transplanted plants, regardless of hardening treatments or time of irrigating after transplanting. Removal of from 70 to 90 percent of the leaf area of lettuce plants reduced the number of early-harvested heads by one-half to three-fourths, and the total heads marketable by one-fifth to one-fourth. This pruning was without consistent effect on the characteristics of the heads that became marketable. Removal of from 40 to 50 percent of the leaves of cauliflower had no important effect, but removing from 70 to 90 percent at transplanting delayed maturity and sometimes reduced total yield. Heavy pruning of celery plants sometimes reduced the yield of celery but was without effect on onion and pepper. Heavy pruning of "large" transplants of celery was more harmful than pruning small ones, but in cauliflower the size

of plants pruned was without measurable effect. Leaf-pruned plants transpired less water per plant than unpruned, but more per unit of leaf area, when the root systems of both groups were of comparable extent. In general, the rate and amount of root growth in celery and cauliflower subsequent to pruning were reduced in proportion to severity of leaf pruning. Plant recovery and resumption of growth appeared directly correlated with the amount of carbohydrate reserves available in the plant as it was transplanted.

Lima beans' response to seed treatment in field tests, G. L. McNEW. (N. Y. State Expt. Sta.). (*Canner*, 94 (1942), No. 17, pp. 10-12, figs. 2).—In a series of laboratory and greenhouse tests designed to establish whether any of the treatments ordinarily used on vegetable and cereal seeds would be effective on the lima bean, Spergon, New Improved Semesan Jr., and tetramethylthiuram disulfide were found promising for field use. In field trials in 1941 Spergon gave particularly good results, as measured in the percentage of emergence, vigor of growth, and increased yield of shelled beans.

Quality in the Chantenay carrot and its relation to seed production, N. K. ELLIS. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 536-538, fig. 1).—Refractive index readings on the expressed juice of a group of 46 carrots carefully selected for outward uniformity showed considerable variation. Edibility was correlated with the quantity of soluble solids as expressed in percentage sucrose. An examination of several different lots of Chantenay carrots showed well-marked differences with respect to degree of uniformity of soluble solids contents. Some evidence was obtained that the higher quality roots rot more readily under unfavorable conditions, with the result that a given seed stock may actually deteriorate in quality through no fault of the seed producer.

Heat and drought tolerance of sweet corn as influenced by tillers, S. A. MCCRORY. (S. Dak. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 424-428, fig. 1).—Observations in plantings of the more common sweet corn hybrids showed pronounced differences in the time that tillering occurred and in the number of tillers per plant, but the time of tillering was not correlated with the date of ear maturity. In another experiment, in which the tillers were removed from half the plants of each variety, it was observed that in a very warm period there was more heat injury in the tiller-bearing plants. In extreme cases every plant showed top firing where tillers were present, and no injury in adjacent rows where the tillers had been removed. Apparently the period when tillers develop is as important to heat and drought resistance as are the number of tillers that are found.

Sugar content of sweet corn pollen and kernels of inbred and hybrid strains susceptible to tassel infestation by aphids, E. S. HABER and W. G. GAESSLER. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 429-431).—The tassels of some inbred lines of sweet corn were observed to be more heavily infested with aphids than were others. Chemical examination of the pollen showed a variation in the percentage of total sugars present, but there was no correlation between aphid susceptibility and the amounts, and no evidence that tassel infestation by aphids is the result of high sugar content of the pollen. Inbred 45, highly susceptible to aphids, had a relatively low sugar content in the pollen. There was little difference between the various strains as regards nitrogen and ether extracts.

Value of molybdenum for lettuce, W. E. BRENCHLEY and K. WARINGTON (*Nature [London]*, 149 (1942), No. 3772, p. 196).—The inclusion of 1 part of molybdenum in 10,000,000 parts of nutrient solution supplied lettuce resulted in larger, deeper green, and apparently more disease-resistant plants. The beneficial effect was observed whether molybdenum was used alone or in conjunction

with one or more other minor elements such as strontium, titanium, vanadium, chromium, and zinc. There was some suggestion that molybdenum fended off symptoms of boron deficiency for some time during the early stages of growth.

Quality lettuce production under Mississippi conditions, L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 8, pp. 1, 4-5, figs. 5).—Information is presented on climatic requirements, varieties, effect of time of planting, seeding methods, cultural practices, harvesting and marketing, etc.

Growing and handling cantaloupes and other melons, G. N. DAVIS and T. W. WHITAKER. (Coop. U. S. D. A.). (*California Sta. Cir.* 352 (1942), pp. 40, figs. 20).—This circular, which supersedes Circular 308 (E. S. R., 56, p. 236), gives general information on the importance of the industry; areas used; soils; fertilizers; planting practices; culture; irrigation; determination of picking maturity; harvesting, grading, and picking; seed production; varieties; control of insect and fungus pests; etc.

The production of first-generation hybrid tomato seed for commercial planting, K. C. BARRONS and H. E. LUCAS. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 395-404, figs. 3).—Information is presented on the methods of technic employed in producing hybrid tomato seed, the possible costs, and the advantages of first-generation seed.

β -naphthoxyacetic acid as an inductor of parthenocarp in tomatoes, F. G. GUSTAFSON. (Univ. Mich.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 387-389).—Seedless fruits produced with β -naphthoxyacetic acid were larger than seeded fruits produced by pollination. Fruit setting was also somewhat greater than with open pollination.

Bay State, a red forcing tomato bred for resistance to leaf mold, E. F. GUBA (*Massachusetts Sta. Bul.* 393 (1942), pp. 8, pls. 8).—Herein is discussed the development of a new tomato variety developed for resistance to the leaf mold fungus *Oladosporium fulvum*. Resistance was obtained in an original cross between commercial varieties and the Red Currant tomato *Lycopersicon pimpinellifolium*. The new variety, named Bay State, is described as to plant and fruit characters. Unfortunately, there appeared in 1940 a new physiologic strain of leaf mold which injured the new variety and its resistant parent, the Red Currant tomato. There was some indication, however, that the Bay State variety possessed some resistance to this new physiologic strain.

November 1940 cold damage to fruit plants in Illinois, V. W. KELLEY and R. L. McMUNN. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 220-224).—Observations following the disastrous early November freeze of 1940 showed that the degree of injury was largely associated with degree of hardening of the tissues at the time of the freeze. Plants that had dropped their leaves suffered little or no injury. The trunk tissue, which normally hardens later than that of small branches and limbs, suffered much more injury than the limbs and buds. The exposure of the orchard was an important factor, with trees on high land and on the windward side of the orchard suffering most severely. The behavior of various species and varieties is discussed.

Fruit tree injury resulting from the Midwest blizzard of November 1940, T. J. MANEY. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 215-219, figs. 2).—A record is presented of temperatures and conditions prevailing before and during the disastrous November 1940 blizzard and of the effects of the abnormally low and unseasonable temperatures on various fruit and ornamental plants. Because of the unusual conditions, varieties of recognized hardiness were in some cases badly injured. In general, however, hardy varieties came through best, and new varieties developed in the colder regions of the country survived better than those developed in the warmer areas.

Budding and grafting on hardy apple stocks, C. W. ELLENWOOD, T. E. FOWLER, and C. A. GREENE (*Ohio Sta. Spec. Cir. 65* (1942), pp. 29, figs. 26).—Largely in the form of illustrations, information is presented on methods of budding and grafting apples, with a view to assisting in the top working of commercial varieties on hardy understocks, such as Virginia Crab, Hibernial, or Haas.

Apple varieties: Behavior of two hundred varieties following the freeze of November 1940, B. S. PICKETT and H. L. LANTZ. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 212-214).—Observations in an apple orchard composed of trees top-grafted on Virginia Crab showed only 6 varieties, Anoka, English Russet, Malinda, Peter, Repka Malenka, and Hibernial, and 13 seedlings to have escaped some injury. A second group of 13 varieties showed upward of 90 percent recovery, and a third group of 23 kinds was classed as having recovery values of from 70 to 90 percent. In addition to an intermediate group of questionable value, there were 45 varieties and 4 seedlings rated as unworthy of saving. Unfortunately some of the most important market varieties, such as Jonathan and Delicious, were included in the unworthy group.

Red varieties of early apples, C. W. ELLENWOOD (*Ohio Sta. Bimo. Bul. 217* (1942), p. 124).—Comments are given on several early-maturing red apples, including Close, Anoka, Crimson Beauty, Early Red Bird, Red Astrachan, Duchess, and Early McIntosh.

Investigations on the time of blossom induction in Wealthy apple trees, B. E. STRUCKMEYER and R. H. ROBERTS. (Wis. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 113-119, figs. 4).—The blossoms from on-year trees and 85 percent of the leaf area of off-year trees were removed to obtain evidence on the time of blossom bud induction. When blooms were removed at the time of full bloom, larger leaves were produced and some blossom buds were formed. A reduction of leaf area from early defoliated spurs inhibited the formation of blossom buds. Spurs defoliated at the time of full bloom and 2 weeks later produced new leaves and some blossom buds. Spurs defoliated 3 weeks after full bloom did not form new leaves and developed only vegetative buds. Spurs defoliated 5 weeks after full bloom formed a number of blossom buds, indicating that induction had proceeded to the extent that total leaf area was no longer needed in the formation of blossom buds. Differences in the anatomical structure of the spurs from off-year and on-year trees were apparent about 4 weeks after full bloom and from 9 to 10 days before defoliation failed to inhibit completely blossom bud formation. A study of the mineral pattern of incinerated sections of off- and on-year spurs showed a different localization of the mineral residues. Reducing the area of the two-tip leaves of a spur shortly after full bloom reduced blossom bud formation, but not to the extent of complete defoliation.

Thinning the apple crop by spraying at blooming, V. R. GARDNER (*Mich. State Hort. Soc. Ann. Rpt.*, 69 (1939), pp. 112-114).—In preliminary trials, three varieties were sprayed, after the removal of all unopened buds, with various materials designed to kill a portion of the blooms. Duchess blooms were by far the most susceptible to injury, Wealthy intermediate, and Ontario least susceptible. Generally, the addition of a wetting agent slightly increased the blossom-killing capacity of the materials used. Much of the success of the operation depended on the use of a proper concentration of materials.

Further studies on the removal of spray residues from eastern-grown apples, M. H. HALLER, C. C. CASSIL, E. GOULD, and A. L. SCHRADER. (Coop. W. Va. and Md. Expt. Stas.). (*U. S. Dept. Agr., Tech. Bul. 828* (1942), pp. 32, figs. 3).—In this further report (E. S. R., 80, p. 49), the authors discuss the interrelation of a number of factors, such as variety, season, spray treatments,

maturity of the fruit, and type of washing treatment used in the removal of lead spray residues from apples. In fruits of equal size there were lower residue values on York Imperial than on Stayman Winesap and Delicious. Growth of the apples and weathering have very little apparent effect on the reduction of the residue during the harvest period, and rainfall also had little tendency to wash off residues. The general effect of a delay between harvest and washing was to increase the difficulty of residue removal. The addition of mineral-oil emulsion to the second-brood cover sprays of lead arsenate and bordeaux mixture increased the residue at harvest by nearly 50 percent, but had little effect when added to the first-brood cover sprays. Heating the washing solutions to 100° F. increased their efficiency. With the most effective washing treatment for each type of machine tested, there were no large or consistent differences between the different machines. In the flotation machine the addition of 1 percent of a wetting agent to the acid solution increased greatly the effectiveness of the wash. Washing treatments using heated solutions did not increase the amount of spoilage in York Imperial and Stayman Winesap apples in subsequent storage.

Days from bloom as an index of maturity for apples, M. H. HALLER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 141-145).—A study of indexes of early picking maturity for Williams, Jonathan, Grimes Golden, and Yellow Newtown apples grown under middle Atlantic conditions showed that pressure tests, ground color readings, and seed color and starch tests were unreliable. Regardless of locality and seasonal variations, the number of days from bloom to maturity was found rather constant during 3 yr. and proved to be a more reliable index of maturity than the other factors studied. It is suggested that harvest should not begin until at least 70, 130, 135, and 150 days after full bloom for Williams, Jonathan, Grimes Golden, and Yellow Newtown, respectively. The optimum maturity stage would be somewhat later.

Pectic changes in Jonathan apples as a measure of ripening under differential carbon dioxide treatments, H. H. PLAGGE and D. V. FISHER. (Iowa Expt. Sta. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 169-171).—Analyses of Jonathan apples following storage in four CO₂ concentrations showed that such treatments retarded the hydrolysis of protopectin to soluble pectin. The soluble pectin content varied proportionately with the CO₂ concentration and with storage temperatures of 32° and 36° F. A residual effect of inhibiting soluble pectin formation was evident, since proportionate differences between samples from the different CO₂ atmospheres existed after the fruit was exposed at room temperature for 2 weeks. Under the same temperature, air-stored apples were consistently higher in soluble pectin than the fruit from any of the CO₂ atmospheres.

The influence of one lot of apple fruits on another, R. M. SMOCK. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 187-192, figs. 4).—The gaseous emanations of ripe apples stimulated to a marked degree the respiration rate of preclimacteric Duchess, Wealthy, and McIntosh apples. In one case the ripe apples were of the same variety as those under treatment. Definite ethylene injury was apparent as a result of passing the vapors from ripe Yellow Transparent over proclimacteric Wealthy fruits. The emanations from ripe McIntosh apples had no effect on the respiration of postclimacteric Yellow Newtown fruits. The blue mold *Penicillium expansum* did not generate sufficient ethylene to stimulate the ripening of Duchess or Wealthy apples.

Handling apples from tree to table, D. F. FISHER (U. S. Dept. Agr. Cir. 659 (1942), pp. 39, figs. 18).—Information is offered on the importance of the proper handling of apples following harvest, the correct stage for picking, factors affecting condition during storage, modified atmospheres in the storage room,

undesirability of storage with certain other products, diseases in storage and their prevention, effects of type of package on fruit in storage, the responsibilities of the shipper, dealer, and industry in the proper handling and display of apples, etc.

Interrelation of pollination, position on cluster, and set of pears, E. W. JENKINS (*Vermont Sta. Bul.* 493 (1942), pp. 27, figs. 2).—As was shown in an earlier bulletin (E. S. R., 85, p. 764), pear blossom position on the cluster is an important factor in fruit setting when more than two blooms are left on the cluster. This further study shows that when only the terminal and basal blossoms of a cluster are left and pollinated neither the position of the blossom on the cluster nor the time of pollination causes significant differences in the set of fruit when cross-pollination is practiced. In the case of self-pollinations, time of pollination appeared to be an important factor since the earlier applications of pollen always produced a greater set of fruit and more good seed.

The response of peaches in Kentucky to cultivation and cover crops and to sod cultures, A. J. OLNEY and W. D. ARMSTRONG. (Ky. Expt. Sta.) (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 123-125).—A soil management study with Elberta peaches conducted at Princeton, Ky., indicated the advisability of maintaining the clean cultivation cover-crop system during the early years of the orchard. On level land not subject to erosion, this system was most satisfactory throughout the entire experiment. On sloping land, however, clean cultivation resulted in erosion and a progressive decline in growth and yield. Because of dry weather that occurs frequently in Kentucky during September and October, it was found difficult to establish winter cover crops sufficient to protect the soil. Sod plats suffered practically no erosion, despite the fact that the annual lespedeza died down each autumn.

New peach varieties found good in Delta, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 8, p. 8).—General information is offered on the time of ripening, productivity, fruit characteristics, and general value of a number of the new peach varieties. Oriole, Halehaven, Valiant, and Kalhaven were found particularly desirable and are recommended as valuable additions to home planting.

Selection of criterion leaves for the identification of blueberry varieties, J. H. CLARK and S. G. GILBERT. (N. J. Expt. Stas.) (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 347-351).—On the basis of measurements of leaves located on different portions of the twig, the fourth, fifth, and sixth leaves from the tip of lateral branches 8-12 in. long were found to exhibit a minimum of variability and are suggested as criterion leaves for measurements made for the purpose of identifying varieties. The tip angle, base angle, and leaf width: length ratio were found valuable and relatively constant variety characters. The base angle of leaves on weak plants tended to be both absolutely and relatively narrower than on vigorous plants.

Effect of soil media, photoperiod, and nitrogenous fertilizer on the growth of blueberry seedlings, F. PERLMUTTER and G. M. DARROW. (U. S. D. A.) (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 341-346, figs. 3).—An analysis of leaf area and total linear growth measurements on blueberry seedlings grown on eight different soil mediums indicated that a mixture of two-thirds forest litter with one-third potting soil was most favorable. The vegetative growth of blueberry seedlings was greatly increased by providing longer days during winter, and the final size at the end of the season was in general proportional to the number of months of supplemental light that the plants had received. No significant difference was evident in the average number of leaves per plant due to exposure to various monthly light periods. There was, however, a signifi-

cant difference in leaf area. No significant increase in growth was obtained by applications of nitrogenous materials, such as urea, sodium nitrate, or ammonium sulfate, during the early stage in the life history of the seedling.

Growth response of blueberries under clean cultivation and various kinds of mulch materials, E. F. SAVAGE and G. M. DARBOW. (Ga. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 338-340).—Mulching in one form or another was found essential to the best growth of highbush blueberries in northern Georgia under the prevailing conditions of high temperature and frequent deficiency of soil moisture. Sawdust, because of its greater power for retaining soil moisture by reducing surface evaporation and runoff, was by far the best mulch tested, and because of cheapness and availability is recommended for mulching blueberries in the Southeast. Looser materials, such as rye straw and oak leaves, were better than clean cultivation, but not so effective as the sawdust.

The influence of various renewal systems and width of row on yields of the Blakemore strawberry, J. C. CRANE and I. C. HAUT. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 368-372).—In the case of Blakemore strawberries grown under a previously fruited thinned-row system, greater yields were obtained when all runners were removed and the original plants fruited the second year than from either the conventional renewal system or a reversion to the matted row. Evidently when thinned rows are allowed to revert to a matted-row condition for second-year fruiting, yields equal to a conventional "barring off" may be obtained. Compared with first-year yields, fruiting the original plants the second year resulted in about 8-percent reduction in yield as compared with 40-percent reduction with the other two renewal systems. Apparently under the 2-yr. plant-renewal system, the plants were able to accumulate larger leaf areas, larger root systems, and food reserves. In the case of 10-, 20-, 30-, and 40-in. spacings between rows, there was a progressive decline in yield as the distance increased.

Some plant-spacing results with six strawberry varieties, W. H. CHILDS. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 357-360).—At Morgantown, W. Va., Blakemore, Catskill, Culver, Fairfax, and Howard 17 strawberry plants spaced 8 in. apart outyielded the same varieties in matted rows. The Gandy variety did not give the same response. The beneficial effect of spacing rested in a greater number of berries and in increased size of berries. In general, production was earlier in the spaced plants, although this did not hold true for all varieties in the 1938 season.

Strawberry plant behavior as influenced by mulch (preliminary report), W. D. ARMSTRONG. (Ky. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), p. 367).—Following the very cold winter of 1939-40 with extremely low temperatures and no snow cover, even the heaviest mulches did not prevent some winter injury. However, injury was very much more severe in beds lightly mulched or receiving no mulch. Heavy December and February mulching retarded blossoming and ripening and reduced weed growth.

Effects of rootstock upon composition and quality of fruit of Concord, Campbell Early, and Moore Early grapes, H. REYNOLDS and J. E. VAILE (*Arkansas Sta. Bul.* 421 (1942), pp. 39, figs. 9).—Based on 3-yr. averages, Campbell Early and Moore Early grapes grown on certain rootstocks were lower in sugars and higher in acidity than fruit from own-rooted vines. On other rootstocks there were no significant differences. With Concord grapes the differences in composition between fruit from grafted and own-rooted vines were not significant. The effects of various stocks on Campbell Early and Moore Early are discussed statistically. The estimation of juice quality by taste of pasteurized

samples showed the juice from fruit produced by grafts on certain stocks to be definitely inferior to juice of fruit from own-rooted vines. Fruit yields of Concord, Campbell Early, and Moore Early were increased by grafting on certain stocks, but the effects on yield and composition were not correlated. With the exception of grafts on Xinta roots, Moore Early fruit from own-rooted vines was smaller in berry size than when grown on various rootstocks. Of the various stocks tested, Wine King, 1202, Cynthiana, and 41-B were most satisfactory for Concord; Cynthiana and 41-B for Campbell Early; and Cynthiana and Wine King for Moore Early.

Resistance of grape varieties to the freeze of November, 1940, G. F. GRAY. (Okla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 329-331).—A study of the effect of the unseasonable and severe freeze of November 1940 on varieties in the station vineyard showed great differences in response. Of 75-odd varieties, 8 had less than 25 percent of their buds injured, 30 had less than 50 percent injured, and 7 had all of their above-ground buds killed. The 1941 crop was very light, and in the 5 highest-yielding varieties—Mericaedel, Edna, Extra, Balley, and Worden—only a few vines produced more than one cluster per shoot, suggesting a high percentage of secondary shoot growth.

Maturity studies with California grapes.—II, The titratable acidity, pH, and organic acid content, M. A. AMERINE and A. J. WINKLER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 313-324).—The present paper (E. S. R., 86, p. 484) deals with changes in titratable acidity, pH, and the organic acids present during maturation and with some of the applications of the data to the appraisal of varieties for wine production. The principal acids of vinifera grapes are tartaric, malic, tannic, phosphoric, and citric, with the first two constituting well over 90 percent of the total. Methods for the separation and determination of tartaric and malic acids and their salts in grape musts are discussed. The pH of grapes grown in California was found higher than in most producing areas, and, generally speaking, the pH of a wine was the same as that of the must, except in fortified wines where it was increased markedly. As the fruits ripen, there is a marked difference in the percentage of the total titratable acidity which is due to tartaric acid and potassium acid tartrate. Varieties could be readily grouped on the basis of these differences. The steady rise in pH during ripening reflects the change in the ratio of acid salts to free acid. In green fruits from 50 to 80 percent of the tartrates are present as free acid, while at maturity only from 10 to 20 percent are in this form.

Leaf sap concentration and cold resistance in the avocado, F. F. HALMA. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 231-235, figs. 4).—At 2-week intervals from May 1938 to April 1940 the osmotic value and the percentage of total soluble solids in the leaf sap were determined for eight varieties of avocados, all grown on Mexican seedling rootstocks. No relationship was observed in the several varieties between osmotic value of expressed leaf sap and cold hardness. Percentages of total soluble solids were in most cases consistently higher in the leaf sap of the harder varieties.

The Amazon Basin Brazil nut industry, W. R. SCHREIBER (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr. Rpt. 4* (1942), pp. [2]+36, figs. 16).—A description is presented of the tree and nuts, natural distribution, methods of harvesting and handling the crop, markets, future possibilities, etc.

Influence of fertilizer and time of its application on growth, yield, and quality of pecans, J. H. HUNTER and R. D. LEWIS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 175-187, fig. 1).—In this experiment, located on Greenville sandy loam soil in Lee County, Ga., and dealing with the fertilization of Moore pecan trees 14 yr. of age at the beginning of the study, tree growth and

nut yields were increased by all fertilizer treatments used. The time of application had no significant effect on yield, and split applications did not prove significantly better than a single application in February. There was an inverse correlation between yield and the size of nuts. The quality of nuts, as measured by specific gravity and percentage of well-filled nuts, was influenced by fertilizer treatment. The nuts of the lowest quality were produced on trees receiving one-half of the fertilizer in February and one-half in June. The best quality nuts were produced on the unfertilized trees. No definite relationship was noted between oil and protein contents and fertilizer treatments.

Medicinal plants of tropical and subtropical regions, A. F. SIEVERS and E. C. HIGBEE (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr. Rpt. 6 (1942), pp. [2]+47*).—Information is presented on a large number of species utilized in the preparation of medicines on their botanical sources; habitat; type of plant; part of plant utilized; commercial uses, sources, and importance; and methods of handling.

Sleepiness in carnations, W. FERGUSON (*Sci. Agr., 22 (1942), No. 8, pp. 509-518, figs. 4*).—Sleepiness, a condition characterized by the partial closing of the flower due to the incurving or curling of the petals, was observed in carnations following shipment in express cars. Since blooms stored in various parts of the grower's establishment showed no signs of sleepiness, the conclusion was reached that some factor present during shipment was the active agent. Carnations were shipped without injury in electrically lighted cars, while those in gas-lighted cars showed much injury. Exposure of carnations to such small concentrations of Pintsch gas as 100 p. p. m. for 24 hr. or 250 p. p. m. for 10 hr. caused severe sleepiness. The minimum concentration was not established. Suggestions are given for the safe handling of carnations in the cars and in the express sheds.

The effect of pruning established rose bushes on bloom production, J. C. RATSEK. (*Tex. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 562-564*).—Production of blooms of the Talisman and Red Radiance roses was reduced in proportion to the severity of pruning. Length of stem was reduced by pruning, especially if the plants were cut back severely to 4 in. Severe pruning was again observed (*E. S. R., 86, p. 633*) to reduce the color of the blooms.

FORESTRY

Economic management of western white pine forests, K. P. DAVIS (*U. S. Dept. Agr., Tech. Bul. 830 (1942), pp. 78, figs. 11*).—With the end of abundant virgin timber in the western white pine forests of northern Idaho in sight, case analyses were made of timber-management problems and possibilities in representative mature and immature stands. In high-quality, mature stands consisting largely of western white pine, the dominant management considerations are (1) liquidation of the high and rather perishable stumpage values which are gaining little if any in value and (2) regeneration. Liquidation offers no difficulties if maintenance of a forest cover is the primary objective, reasonably adequate slash disposal being the only silvicultural cost necessary. An understory of western hemlock, present in most stands, takes over the site following the removal of the white pine and affords a complete although almost entirely unmerchantable forest cover. Regeneration of white pine is costly, as valuable seed trees must be reserved and most of the understory removed, or else the land must be clear-cut, burned, and planted. In the average-quality mature stand of about one-half white pine and one-half associated species, a two-cut installment plan of harvest is commercially practicable. In a young, thrifty, well-stocked stand of western white pine and associated species just reaching merchantable

size, considerable partial-cutting possibilities exist, and a plan of action is offered. Protection problems of fire, insects, and disease in the region are briefly evaluated from a timber-management point of view. The large question mark in the future of western white pine is the control of blister rust, without which continued commercial exploitation of the species is deemed impossible.

A case analysis of the cost of growing western white pine forests on a long-time basis is presented, and conclusions are drawn. With a fully regulated forest operated on a partial-cutting plan, estimated returns slightly exceed costs. Opportunity for private investment in long-time timber growing is slight, despite the fact that the costs of blister rust and insect control and part of the fire protection are largely carried by public funds.

Management of loblolly pine in the pine-hardwood region in Arkansas and in Louisiana west of the Mississippi River, H. H. CHAPMAN (Yale Univ. School Forestry Bul. 49 (1942), pp. [6]+150, pls. 20, figs. 8).—Based on observations and studies extending over a long period of years, information is presented on the relations of loblolly pine with associated species, conditions influencing reproduction and establishment of loblolly pine, systems of cutting loblolly pine, the importance of sustained yields, the basis of selection of trees for cutting, principles and methods of thinning and pruning young even-aged stands, effects of thinning on the growth of individual trees, the prediction of yields of pulpwood and lumber, and the control of pests. A summary of rules for management is presented.

Competition in some coniferous plantations, W. R. ADAMS and G. L. CHAPMAN (Vermont Sta. Bul. 489 (1942), pp. 26, pls. 4, figs. 6).—An examination after 28 years' growth of 5 coniferous species of forest trees planted on poor loamy soils typical of the Champlain Valley sand plains showed marked differences between species in their capacity to grow and produce economic timber crops. The trees were spaced at various intervals from 2 to 8 ft. apart to simulate conditions comparable to those of managed and unmanaged stands. Severe competition in dense stands resulted in stagnation in jack pine with reduced growth even by the crop trees. With Scotch pine many of the trees died early, providing the remainder with more growing space. With Norway (red pine) and northern white pine some of the trees assumed dominance and grew more rapidly so that the dense stand conditions were not so inhibiting. However, timber yields were not so large as in the less closely planted stands. Pitch pine grew slowly and was classed as a low-producing tree on soils of the type included in the study. The Norway, white, and jack pines grew satisfactorily. In the less-dense stands the jack pine was slightly more productive of timber in the 28 yr. than were Norway and white pines, but the latter species had the larger bole diameters. Norway and white pines are recommended for planting on sandy soils but require good management with adequate thinnings to produce good lumber. It is concluded that the poor, abandoned water- and wind-eroded light loamy soils, totaling more than 250,000 acres in northwestern Vermont, can be returned to a productive condition by planting with coniferous species.

Mycorrhizal inoculation of soil of low fertility, R. F. FINN (Black Rock Forest Papers, 1 (1942), No. 19, pp. 115-117, fig. 1).—In soils of low fertility, inoculation of white pine seedlings with known mycorrhiza-forming fungi and mycorrhizas resulted in significant growth increases. N and K were absorbed in significantly larger amounts by mycorrhizal seedlings. N deficiency in the non-inoculated seedlings produced a characteristic yellow-green color in the needles.

Improvement cuttings in mixed hardwoods, H. H. TRYON and R. F. FINN (Black Rock Forest Papers, 1 (1942), No. 20, pp. 119-126, figs. 12).—In general, very good natural reproduction followed one or more light thinnings yielding not

over 5 to 6 cords per acre per year, especially if the thinning was done in good seed years. Too severe thinning was found harmful. Good hardwood sprouts were obtained from low stumps not over 5 in. in diameter. Initial selective weedings or releases in young hardwoods should be withheld for at least four or five seasons following the first thinning in the overwood.

The comparative influence of leaf mould and inorganic fertilizers on the growth of red oak, R. F. FINN and H. H. TRYON (*Black Rock Forest Papers, 1* (1942), No. 17, pp. 107-109).—In May 1938, plats established in a mixed hardwood stand, consisting generally of red, chestnut, and white oaks and red maple, were fertilized with leaf mold at the rate of 2.5 tons per acre, nitrate of soda at rates of 200 and 400 lb. per acre, and superphosphate at the rate of 400 lb. per acre. Measurements in 1940 of the radial increment of the trees in the several plats showed the greatest gain in the humus plats, followed next by the superphosphate plat. Nitrogen and phosphorus percentage in the leaves were somewhat higher in these two plats than in the nitrate plats.

Notes on the resampling of certain fertilized plots, R. F. FINN (*Black Rock Forest Papers, 1* (1942), No. 16, pp. 103-105, figs. 4).—A comparison of the results of analyses of red oak leaves collected in September 1940 from plats that were differentially fertilized in 1935 showed, since analyses in 1936, a significant decrease in available N in the sodium nitrate-ammonium sulfate area and a significant increase in N in the area fertilized with dried blood. The rock phosphate plats showed a significant decrease in available P. K availability increased significantly in all areas in all plats in the K series except one. N availability was increased in the control area, suggesting that the thinning given the plats before fertilizing had increased the supply of N available to the remaining trees.

Tests of chemical control of hardwood sprouts, H. H. TRYON and R. F. FINN (*Black Rock Forest Papers, 1* (1942), No. 18, pp. 111-113, fig. 1).—Evidence was obtained that either calcium chloride (1 lb. per gallon of water) or ammonium thiocyanate solution (0.75 gal. of liquor and 0.25 gal. of water) would insure practically 100 percent prevention of sprout development if accompanied by complete hacking or ringing of the stumps.

Equipment and methods for harvesting farm woodland products, C. J. TELFORD. (Coop. Univ. Wis.). (*U. S. Dept. Agr., Farmers' Bul. 1907* (1942), pp. [2]+25, figs. 22).—This deals with felling trees and the making, skidding, hauling, loading, grading, and scaling of logs; poles and piling; posts, mine timbers, excelsior, and pulpwood; ties; fuel wood; shakes; sharpening crosscut saws; air-drying lumber; and the control of blue stain and checking in logs. Proper care of tools and safety precautions in their use are emphasized throughout. The making of some of the hand tools and certain loading and hauling equipment, of circular saw set-ups, and of an electrically driven crosscut saw ($\frac{1}{4}$ hp. motor) are also discussed.

Wood fuel in wartime, R. T. HALL and M. B. DICKERMAN (*U. S. Dept. Agr., Farmers' Bul. 1912* (1942), pp. [3]+22, figs. 11).—This publication, prepared in collaboration with the Northeastern and Lake States Forest Experiment Stations and the Forest Products Laboratory, is intended to point out the best sources of wood fuel, its heating value, and some recently developed technics in producing, transporting, and utilizing fuel wood. The primary topics dealt with are wood fuel and Nation-wide war production; increasing the use of wood fuels; production, marketing, and purchase of fuel wood; and selection of material to cut.

Forest products statistics of the Central and Prairie States, R. V. REYNOLDS and A. H. PIERSON (*U. S. Dept. Agr., Statis. Bul. 73* (1941), pp. 94, figs. 3).—As the sixth and last of a series covering the entire Nation (*E. S. R.*, 84, p. 480),

this bulletin presents forest-products statistics for seven Central and five Prairie States.

[Stumpage and log prices for the calendar years 1939 and 1940], H. B. STEER (*U. S. Dept. Agr., Statis. Buls. 75 (1941), pp. 67, figs. 4; 76 (1942), pp. 67, figs. 4*).—Prepared in the usual manner (*E. S. R.*, 84, p. 341), these bulletins contain data presented largely in tabular form on total stumpage and log sales for the Nation and by States, with information on prices, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, [September 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 26 (1942), Nos. 16, pp. 341-373; 17, pp. 375-388*).—In addition to the host-parasite check-list revision, by F. Weiss (*Nos. 16, Schaefferia to Smilax, and 17, Sophora to Sorbus*), the following are included:

No. 16.—1939, 1940, and 1941 additions to the list of causes of fungus and bacterial plant diseases in Maine, by M. T. Hilborn; some estimates of losses from plant diseases in the United States prior to 1917, by N. E. Stevens; notes on diseases of soybeans and other legumes in Oklahoma, by J. H. McLaughlin; soybean diseases in Iowa, by G. C. Kent; *Sclerotium rhizodes* on grasses in Pennsylvania, by K. W. Kreitlow; single-virus streak of greenhouse tomatoes, by R. W. Samson; garlic mosaic in Texas, by G. E. Altstatt; observations on cucurbit downy mildew in South Carolina, by C. J. Nusbaum; tomato diseases reported from New York; vegetable diseases in Massachusetts, by O. C. Boyd; plant diseases occurring in Nebraska prior to July 18, 1942, by J. E. Livingston; some new records for *Verticillium* diseases; susceptibility of some common rose understocks to nematode root knot, by G. E. Altstatt; reports on potato late blight in North Dakota, Rhode Island, and New York; and brief notes on downy mildew on celtuce (*Lactuca*) in Pennsylvania, scarcity of sweet corn bacterial wilt, parasitization of rusts in Kansas, and sources of ergot for drug purposes.

No. 17.—*Thyronectria austro-americana* disease of honey locust (*Gleditsia triacanthos*) in the South, by B. S. Crandall; Spergon and Thiosan as seed treatments for small grains, by R. W. Leukel; reports on barley and wheat scab in Virginia, scab on *Paspalum notatum* in Florida, and wheat and barley scab absent in western North Dakota; reports of an unusual amount of damage by *Helminthosporium turcicum* leaf blight on field corn in Pennsylvania and Ohio, and of *Diplodia macrospora* leaf spot in Mississippi; cereal diseases in the Pacific Northwest and Intermountain States in 1942, by C. A. Suneson; reports on soybean diseases, including an undetermined apparently virus disease of edible soybeans in Rhode Island, tobacco ring spot on edible soybeans in Indiana in 1941, soybean diseases in Virginia and western North Dakota, and two new records for the frogeye leaf spot (*Cercospora diazu*) in Maryland and Virginia; late blight of potatoes in Maryland, southwestern Virginia, the Gainesville section of Florida, and Ohio and early blight of potatoes in western North Dakota, tomato fruit rot and early blight in Pennsylvania, tomato leaf spots destructive in Ohio, and negative report on tomato virus tip blight for Minnesota, North Dakota, South Dakota, and Nebraska; and brief notes on fire blight on pears in Florida, and tetrachloro-*p*-benzoquinone as a growth stimulant.

Report of the twenty-sixth annual meeting of the Pacific division of the American Phytopathological Society (*Phytopathology*, 32 (1942), No. 9, pp. 826-830).—Abstracts of 19 papers on plant diseases and/or their control are included.

[Phytopathological studies by the Arkansas Station] (*Arkansas Sta. Bul.* 417 (1942), pp. 30-34, fig. 1).—Progress reports by S. B. Locke, E. M. Cralley, and V. H. Young are given on development of disease-resistant tomatoes, with special reference to early blight and *Septoria* blight as well as to wilt; the reactions of cotton varieties to strains of the *Fusarium* wilt fungus; and treating cottonseed for control of seedling blight and boll rot.

[Plant disease studies by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 29-32, 65-66, 95).—Brief reports by C. M. Tucker, J. E. Livingston, J. T. Middleton, M. A. Smith, and C. G. Vinson are included on the effects of seed treatments on stands, yields, and control of *Fusarium moniliforme* infection in corn, on winter hardiness, yields, and disease control in barley, and on yields of oats; breeding tomatoes for *Fusarium* wilt resistance; morphologic and physiologic studies of the genus *Phytophthora* (coop. Calif. and Oreg. Expt. Stas.); spraying for control of apple scab and pear leaf spot (*Fabreaa maculata*) (coop. U. S. D. A.); purification and properties of plant viruses; and cottonseed treatment for anthracnose control.

Plant diseases (*Nebraska Sta. Rpt.* [1941], pp. 37-41).—Brief reports of station work, by R. W. Goss, J. H. Jensen, J. E. Livingston, M. W. Felton, E. Kneen, E. Wright, and C. E. Dallimore, are included on the physiology of and breeding for resistance to halo blight in beans and variation in strains of the causal bacteria (*Phytomonas medicaginis phaseolicola*); *Fusarium* wilt, scab, spindle tuber, ring rot, and haywire disease of potato; inoculation method for wheat bunt; charcoal rot of corn and sorghum; damping-off of broadleaf seedlings and *Phomopsis* blight of eastern red cedar in the nursery (coop. U. S. D. A.); and sugar beet diseases.

[Phytopathological work by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1941, pp. 64-73; 104-105, 114, 115, 120-121, 135, 144-147, 161, 162, 163, 166, 168, 170, 174, 181-182).—Brief notes of progress, by W. N. Ezekiel, C. H. Rogers, [J. E.] Simpson, [C.] Nelson, [Jr.], L. M. Blank, P. J. Talley, Mason, F. M. Eaton, N. E. Rigler, A. A. Dunlap, A. L. Harrison, G. E. Altstatt, G. KenKnight, H. P. Smith, E. W. Lyle, Watkins, H. F. Morris, B. C. Langley, E. C. Tullis, C. E. Minarik, P. A. Young, G. H. Godfrey, and S. S. Ivanoff, are presented on cotton (*Phymatotrichum*) root rot investigations, including weather relations, attenuation of cultures by repeated mycelial transfer, resistance of seedling trees, susceptibility test of various plant species in the nursery, organic acids as growth substances for the fungus, eradication methods for nurseries and orchards in deep sandy soil, winter cover crops, tillage, and fertilizers v. control, relationship between pH and inorganic N sources in cultures of the fungus, its growth reactions to amino nitrogens, absorption and utilization of inorganic and organic N, cotton plant physiology v. root rot susceptibility, cotton plant inoculations under various nutrient conditions and fruiting studies in relation to nutrients, root rot sclerotia, rotations in relation to root rot, and sulfur and crude oil in control; cotton infection from acid delinted treated seed v. untreated fuzzy seed; control of angular leaf spot of cotton; cotton varieties resistant to wilt and root knot and two kinds of resistance to wilt as affected by root knot, and preferable varieties of wilt-resistant cotton; tomato disease studies, including spraying for and breeding for resistance to *Alternaria* early blight, *Stemphylium* gray spot in Texas, nematode reactions of tomato varieties and species, rosette of unknown cause, *Fusarium* wilt resistance, white flowers as a marker for *Fusarium* wilt immunity, varietal resistance to blossom-end rot, effects of Cu sprays on Marglobe tomato yields, and lethal gene leaf spot abnormality; seed treatments for beets, cucumbers, peas, and spinach; peanut disease studies, including southern blight and *Cercospora* leaf spot; field tests

of *Fusarium* wilt resistant watermelons; spraying and dusting cantaloups for downy mildew; garlic diseases; onion neck rot prevention in cold storage, and leaf blight (cause unknown); spraying peaches for scab and brown rot; rose diseases, including root knot resistance, spraying for black spot, *Diplodia* die-back, streak disease, chlorosis control, and crown gall and hairy root control; rice diseases, including incidence of leaf spots, *Curvularia lunata* in relation to black kernel disease, white tip in relation to Ca and Mg, and straighthead disease factors; charcoal disease (*Sclerotium bataticola*) of sorghums; disease resistance in grain sorghums and Sudan grass hybrids; *Pijthium*-resistant milo strains; soil fumigation for control of crop pests, including root knot and southern blight (*Sclerotium rolfsii*); burning of tomato plants avoided by improved fertilizer drill; cabbage damping-off control, *Alternaria* leaf spot varietal reactions, and seed treatment for black rot; citrus stem-end rot, mineral-deficiency chlorosis, N-starvation chlorosis, chemical deposits on foliage of citrus and other plants and their possible relation to chlorosis and yield, and pruning-wound protectants; strawberry chlorosis; *Alternaria* leaf blight of carrot; virus-induced "yellows" of eggplant; and sulfur in relation to chlorosis in cowpeas and root-nodule production, and root knot susceptibility of cowpeas.

Investigations on copper deficiency in plants, C. S. PIPER (*Jour. Agr. Sci. [England]*, 32 (1942), No. 2, pp. 143-178, pls. 5, fig. 1).—A water-culture technic is described, making possible the precision determination of effects on plant growth of the absence of traces of the various heavy metals. The essentiality of Cu for plant growth was confirmed, and the quantitative data presented indicate that addition of traces to a nutrient solution leads to growth increases of the order of 200-1,200 percent. The characteristic symptoms from growing oats, peas, wheat, Wimmera ryegrass, *Phalaris*, flax, tomato, subterranean clover, and alfalfa in nutrient solutions without Cu are described. Analytical data are also included. The degree of moisture saturation of the soil had little effect on the Cu uptake of plants. An increase of soil acidity to pH 4.7 increased the availability somewhat, but partial sterilization by heat had a greater effect. In neither case, however, was the increase of the same order of magnitude as the corresponding increase in Mn availability. The increased absorption of Cu by plants as the result of CuSO_4 applications to the soil was small. Rye absorbed more Cu from a given soil than oats, and could be grown normally to maturity in a soil on which oats failed from Cu deficiency. There are 40 references.

Method of obtaining pure cultures of *Corticium stevensii* from sclerotia, E. C. TIMS and F. BONNER. (La. State Univ.). (*Phytopathology*, 32 (1942), No. 9, pp. 824-825).—In attempting to obtain pure cultures of this fungus, about 1,500 sclerotia from fig and tung branches were given various types of sterilization and plated out on aqueous agar. Best results were obtained by soaking them in a mixture of 1-1,000 HgCl_2 in 50 percent ethyl alcohol for 2 min. and washing in sterile water.

Effects of some mild forms of mosaic on potato and a few other plants, W. E. STONE. (Vt. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 4, pp. 195-207, figs. 5).—Width of palisade layer and thickness of leaf in potato were found little affected by mild mosaic virus, but, in general, intercellular spaces were larger than in normal leaves. Chloroplasts were reduced in size and number in leaves showing mild mosaic mottle. Those in affected areas could be readily distinguished by staining reactions, and their starch grains were smaller and more numerous than in healthy leaves and were not readily removed from the plastids during darkness. The nuclei of mottled potato leaves were considerably smaller than in comparable healthy leaves. On raspberry, cells in the upper leaf epidermis of yellow parts were appreciably smaller

than those of green parts of either the same or of healthy leaves. Blackberry leaves with rugose mosaic had upper epidermal cells in green parts larger than in yellow parts and lower epidermal cells smaller than in yellow parts. Comparisons of size and number of stomata in green and yellow parts of affected leaves showed no consistent difference. In blackberry infected with mild mosaic, epidermal cells were smaller in yellow than in green parts, but the stomata were larger and more numerous. In groundcherry, epidermal cells were considerably larger in healthy than in mosaic leaves, but stomata varied little in size or number, at least on an area basis. There are 23 references.

Antibiosis in the elimination of *Phymatotrichum omnivorum* sclerotia from soil, F. E. CLARK and R. B. MITCHELL. (U. S. D. A.). (*Jour. Bact.*, 44 (1942), No. 1, p. 141).—An abstract.

Factors affecting the activity of *Pseudomonas-Phytomonas* fluorescent bacteria in soil, R. B. MITCHELL and F. E. CLARK. (U. S. D. A.). (*Jour. Bact.*, 44 (1942), No. 1, p. 141).—An abstract.

The spread of virus diseases of the yellows type under field conditions, V. L. FRAMPTON, M. B. LINN, and E. D. HANSING. (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 9, pp. 799-808, figs. 6).—The various factors related to wind and weather, which vary in an indeterminable manner and which influence insect behavior, probably are considered as insurmountable barriers to a rational consideration of the spread on insect-transmitted diseases, but an understanding of the pattern produced under field conditions would be of obvious value to plant pathologists. The authors have attempted such a rational consideration of disease spread in a special case of the insect transmission of viruses of the yellows type. A differential equation describing the dissemination of viruses of this type in the field has been derived and integrated, and data obtained in two experiments are said to satisfy two demands of the integrated form. The assumptions involved in the derivation of this equation were that the movements of the insect vectors are random, that the number of plants becoming infected is proportional to the number fed upon, and that spread from plant to plant within the field is of small importance. The boundary conditions set up in obtaining the field data were that the insect population in the newly plowed field was negligible, that the insect reservoir was not substantially depleted during the course of the experiment, and that the effects at the ends of the fields be neglected. Although an evaluation of constants cannot be undertaken, the general equation developed seems to describe adequately the distribution pattern, inasmuch as data on hand satisfy the demands of the equation. The observations reported include the dissemination of yellow dwarf of potatoes into potato fields and the dissemination of aster yellows into endive and lettuce beds.

Extraction of auxin from maize, from smut tumors of maize, and from *Ustilago zeae*, J. E. MOULTON (*Bot. Gaz.*, 103 (1942), No. 4, pp. 725-739).—For a given weight of smut tumors, water extraction yielded a greater amount of auxin than that by ether. Dry ether extracts were not active. Water is necessary for liberating auxin from the tissue, and its action may be hydrolytic. Corn smut tumors yielded auxin slowly with either water or ether extraction. The auxin was almost completely removed from *U. zeae* in one ether extraction. Smut tumors from corn leaves or stems yielded more auxin than healthy leaves or stems. Strains of *U. zeae* grown on a synthetic medium containing neither proteins nor amino acids produced auxin. Extracts of both types of medium on which *U. zeae* had grown for 2 mo. contained much auxin, and practically the same amount in each case. The pathogenicity of strains of *U. zeae* was apparently correlated with their ability to produce auxin in a bactotryptone or a synthetic medium. There are 22 references.

Host and pathogen indices to the diseases observed on grasses in certain western States during 1941, G. W. FISCHER, R. SPRAGUE, H. W. JOHNSON, and J. R. HARDISON. (Coop. Wash. and N. Dak. Expt. Stas.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1942, Sup. 137, pp. 87-144).—Data from collections and observations of grass diseases in Arizona, California, Idaho, Minnesota, Nebraska, Oregon, North and South Dakota, Utah, Washington, and Wyoming in 1941 are summarized. Due to the unprecedented rainfall of the growing season in most of the areas, foliage diseases were considerably favored as shown by the unusual number and extent of development of leaf spots, rusts, and bacterial diseases. The report includes 259 species and varieties of grasses on which a total of 161 diseases are recorded, among them 62 leaf spots, streaks, etc., 30 rusts, 28 primary and secondary root rots, and 25 smuts.

Claviceps yanagawaensis in imported seed of Japanese lawn grass, C. L. LEFEBVRE. (*U. S. D. A.*). (*Phytopathology*, 32 (1942), No. 9, pp. 809-812, figs. 2).—Sclerotia of *C. yanagawaensis* (new to the United States) were found in Japanese lawngrass (*Zoysia japonica*) seed from Japan. Treating it with a 75 percent solution of H_2SO_4 for 20-30 min. killed the ergot sclerotia and improved the germination of the seed. A rye hybrid, highly susceptible to *C. purpurea*, failed to become infected when inoculated with mature ascospores of *C. yanagawaensis*.

Mercury substitutes for turf disease control, P. P. PRONE (*New Jersey Stas. Nursery Disease Notes*, 15 (1942), No. 1, pp. 4).—Following the preliminary work (E. S. R., 87, p. 810), extensive tests have been made, not only with tetramethyl thiuram disulfide (T. M. T. D. or Thiosan) but also with the organic compounds Spergon and Lawn Sinox, on outdoor turf under environal conditions so favorable for dollar spot that it was doubtful whether even mercurials would have given good control. In two blocks of Seaside Bent and of a mixture of Creeping and Colonial Bent, respectively, both Thiosan and Sinox gave marked reductions in dollar spot, but Spergon was considerably less effective.

Breeding corn hybrids for smut resistance, G. H. STRINGFIELD and D. H. BOWMAN. (*U. S. D. A. and Ohio Expt. Sta.*). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 486-494, figs. 3).—Corn smut (*Ustilago zeae*) counts in 48 performance tests indicated about three-fourths of the hybrid entries to carry less infection than the open-pollinated varieties, and 12 inbred lines appeared to be more or less resistant. Hybrids in which half or more of the parentage consisted of these resistant inbred lines showed less than a third as much smut as the open-pollinated varieties. Furthermore, it is shown that hybrids have been developed that combine a high degree of smut resistance with other desirable agronomic characters, and such hybrids are being grown extensively. Use of these and similar hybrids in other States is said to constitute the first significant advance in the control of corn smut. There are 17 references.

A root rot of cotton caused by *Thielaviopsis basicola*, C. J. KING and J. T. PRESLEY (*Phytopathology*, 32 (1942), No. 9, pp. 752-761, figs. 3).—It was determined in 1938 that this new cotton disease, especially injurious to American-Egyptian varieties in two widely separated areas of Arizona, is due to *T. basicola*. Seedling stands are often destroyed, but surviving plants tend to recover under prevailing high midsummer temperatures. However, in the fall occluded root lesions of such plants may become active and cause their death. Taproots of the unthrifty infected seedlings exhibit a purplish-black rot and often cavities in the central cylinder, and affected mature plants have a taproot swollen near the collar and an internal purplish-black rot of the vascular system. The brownish chlamydospores in the conductive tissues of diseased plants are char-

acteristic. In culture, the cotton isolate from Arizona resembled tobacco isolates from Tennessee and Missouri, though slight differences in color, density, and sectoring habits of colonies were observed. Reactions of these various isolates on the hosts were essentially the same, as shown by inoculations and cross-inoculations on the cotton varieties used and on Maryland Broadleaf tobacco. Under greenhouse conditions, nearly all inoculated plants developed symptoms but only a few of them died.

Cotton wilt in Alabama as affected by potash supplements and as related to varietal behavior and other important agronomic problems, H. B. TISDALE and J. B. DICK. (Ala. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 405-426, figs. 3).—From several 1- to 4-yr. field tests on *Fusarium* wilt-infested plats at various Alabama locations, it was indicated that development of the disease varies greatly among localities, by seasons within localities, and among varieties within localities by seasons. In areas where tests were conducted for 3 yr. or more, there was an average of 45-83 percent of wilt-infected plants in the highly susceptible group and much fluctuation in the weakly tolerant group with an average of 9-56 percent. In most areas the resistant and highly tolerant groups were distinguishable only with difficulty. The increased severity of the infection in the tolerant-resistant groups at three stations may have been due to a deficiency of K, and in a fourth area with severe infection root knot may have been a contributing factor. The relatively constant ranking of varieties or strains with respect to percentage of wilt, regardless of general wilt severity, is interpreted as field evidence against the existence of physiological races of the fungus differing greatly in their ability to parasitize specific varieties. The differential response of varieties to K and the influence of seasons and other environal factors are indicated as of greater practical concern than are possible races that might complicate the breeding program.

"The potash-variety-wilt studies at Auburn, Moundville, and Alexandria showed that varieties differ with respect to potash needs for normal development or for withstanding wilt attacks. This differential response of varieties to potash treatments appears to be associated with the grouping of varieties with respect to resistance. At Auburn and Alexandria, where the wilt was not severe except on the susceptible and highly susceptible varieties, these varieties continued to respond favorably to increasingly heavy applications of potash. Where wilt was exceptionally severe, as at Moundville, heavy applications of potash did not enable such varieties to overcome wilt. At Moundville heavy applications of potash were of greatest value to the resistant varieties. On the other hand, 3 years' results at Auburn showed that resistant varieties require only a moderate amount of potash for maximum yields and that greater amounts are harmful. There was a rather close, but inverse, relationship between yield of seed cotton and the percentage of wilt-affected plants at the midseason count."

Treatments recommended for prevention of heavy annual loss from oat smuts, J. A. PINCKARD (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 8, p. 6).—An informative paper on loose and covered smuts of oats, including directions for preventive seed treatment by New Improved Ceresan and by liquid formaldehyde.

Survey of potato diseases in peat soils in California, E. J. PETERS (*Amer. Potato Jour.*, 19 (1942), No. 5, pp. 105-106).—The author's culture survey of 129 wilted plants grown under conditions obtaining in peat soils gave about 68 percent infected by *Rhizoctonia solani*, nearly 21 percent by *Erycinia phytophthora*, and about 3 percent each for ring rot alone and plus blackleg. The need for more careful and critical examination of plants in the field along with laboratory tests is emphasized for determining the causal agents in such cases.

Three years' comparisons of dusts and bordeaux spray for potato production in central Jersey. R. H. DAINES, J. C. CAMPBELL, and W. H. MARTIN. (N. J. Expt. Stas.). (*Amer. Potato Jour.*, 19 (1942), No. 5, pp. 90-96).—Tests over a 3-yr. period (1938-40) with bordeaux mixture and copper lime dust are compared with pyrethrum and rotenone, used alone or jointly, as foliage protectants in central New Jersey for control of foliage diseases, flea beetles, and leafhoppers. From the results under a wide variety of growing seasons it was clear that no one foliage protectant is best under all conditions. Detailed results for each season are summarized.

A histological study of hollow heart of potatoes. J. LEVITT. (Minn. Expt. Sta.). (*Amer. Potato Jour.*, 19 (1942), No. 7, pp. 134-143, figs. 6).—Hollow heart was found to arise in a necrotic patch of cells after it had become surrounded by a cambium layer. Though the largest hollows usually occurred in the largest tubers, early stages were observed in those weighing as little as 1.8 gm. The condition was noted in the earliest harvest examined (July 24), its incidence being double that in the latest. Treatments affected its incidence only when given early in the season, indicating that the disorder must have originated in all tubers at that time. Measurements revealed the perimedulla cells adjacent to the edge of the hollow to be larger than the pith cells adjacent to the face. This may indicate more rapid growth in the former tissue, a possible factor in hollow heart formation. All six of the minerals investigated (K, Cu, Mg, Fe, Mn, and Ca) occurred in larger amounts (dry weight) in the healthy than in the affected tubers. The excess in the pith as compared with the perimedulla was also reduced.

Incidence of hollow heart in potatoes as influenced by removal of foliage and shading. F. A. KRANTZ and E. P. LANA. (Minn. Expt. Sta.). (*Amer. Potato Jour.*, 19 (1942), No. 7, pp. 144-149).—Foliage removal at successive stages of tuber development (1940-41) was followed by a decrease in the number of hills free from hollow heart when done at the time of tuber setting but not later. Shading with black sateen cloth for 5-10 days tended to increase the number of unaffected hills when done at time of tuber setting but not 21 days later. About the same incidence was observed in hills harvested when their average weight was 157 gm. and the individual tuber weight 7.5 gm. as when the plants matured and the average weight per hill was 776 gm. and the tuber weight 53 gm. Removal of 20, 40, 60, and 80 percent of the foliage did not significantly influence the average number of tubers set per hill, mean yield per hill, or mean weight of individual tubers. Foliage removal was followed by a very active renewal of vine growth and a delayed vine maturity. This active renewal of vine growth may have been a significant contributing factor in increasing the incidence of hollow heart in the early period of tuber enlargement.

Accuracy of the ultraviolet-light method for selecting ring rot free potato seed stocks. V. E. IVERSON and F. M. HARRINGTON. (Mont. Expt. Sta.). (*Amer. Potato Jour.*, 19 (1942), No. 4, pp. 71-74).—In comparisons of the ultraviolet-light and gram-stain methods for selecting seed stocks free from ring rot it was found that the former is as effective as the latter, that examinations require less than one-tenth the time of the gram stain, and that the ultraviolet method has additional value in reducing the incidence of other "vascular" diseases.

Resistance of certain potato varieties and seedling progenies to ring rot. R. BONDE, F. J. STEVENSON, C. F. CLARK, and R. V. AKELEY. (Maine Expt. Sta. and U. S. D. A.). (*Phytopathology*, 32 (1942), No. 9, pp. 813-819).—*Phytophthora spediocarpa* has spread rapidly, and the presence of even a trace of infection is a menace to successful production from susceptible potato varieties. Seeking to determine the availability of resistant or immune potato strains, the authors

tested 54 named foreign and American varieties and a number of unnamed seedling varieties for susceptibility. Among these, 2 foreign varieties and 2 seedlings appeared to be resistant, and of the latter one had attractive tubers and the other desirable commercial qualities. Nearly half of the progeny of a cross between the resistant President and the susceptible Katahdin varieties proved resistant, and a few selections from a cross between 2 susceptible varieties were more resistant than either parent. Judging from these results it should not be very difficult to develop strains combining ring rot resistance with other commercially important qualities.

Prevention of potato seed piece decay, O. H. ELMER. (Kans. Expt. Sta.) (*Amer. Potato Jour.*, 19 (1942), No. 2, pp. 19-23).—The results of this 6-yr. investigation indicated that under Kansas conditions seed-piece decay can be largely prevented by treatment with acidulated corrosive sublimate or with yellow oxide of mercury. The former also proved effective for sterilizing tuber-borne *Rhizoctonia sclerotia* and for preventing spread of ring rot bacteria from infected to noninfected seed pieces during planting operations. Hot formaldehyde treatments and preplanting suberization of cut seed pieces were not so effective against seed-piece decay as were the mercurials.

Formation of biologically active tobacco-mosaic virus in vivo, as affected by nitrogen supply, E. L. SPENCER (*Jour. Bact.*, 43 (1942), No. 5, p. 646).—An abstract.

The control of damping-off of vegetables by formaldehyde and other chemicals, W. J. DORAN, E. F. GUBA, and C. J. GILGUT (*Massachusetts Sta. Bul.* 394 (1942), pp. 20).—The original object of this study was to determine the relative merits of certain chemicals for controlling damping-off of vegetables in hotbeds and coldframes, where at least 90 percent of the trouble in the State proved due to *Pythium* spp., with *Rhizoctonia* important on crucifers and *Aphanomyces euteiches* often responsible on celery. No one best dry chemical treatment was found for seeds of all vegetables. A list of vegetables together with the seed treatments found best to improve the stand of each is given. Applied to the soil after seeding, chloropicrin gave very good control, but is not preferred by the authors. Vinegar gave more effective control in acid than in alkaline soils, and both this and acetic acid were good substitutes for formaldehyde but in general not equal to it. Spraying seedbeds and seedlings with bordeaux, red cuprous oxide, or zinc oxide were less satisfactory than soil treatments with formaldehyde or certain seed treatments. Substances containing sodium hypochlorite were inferior to formaldehyde, acetic acid, or chloropicrin. Salicylic acid, pyroligneous acid, and oxyquinoline sulfate gave good results with the vegetables on which they were used. Calcium cyanamide was more especially useful where it was necessary to treat the soil before seeding. Ammonium hydroxide and ammonium sulfate applied to soils of high pH gave very good control. Pea stands were much improved by formaldehyde applied in the rows at seeding time. Formaldehyde gave good results on vegetables when applied by subirrigation, provided the soil was not too moist. Plant growth was usually improved when it was applied to nonsterilized soil, but not to soil recently steamed. Applied before seeding, formaldehyde gave good protection against damping-off for about 5 days after soil treatment, but little or none after 11 days. Detailed directions and results for these and other treatments are presented and discussed. There are 20 references.

Resistance of cucumber seedlings to damping-off as related to age, season of year, and level of nitrogen nutrition, T. T. McCUBRE and W. R. ROBBINS. (N. J. Expt. Stas.). (*Bot. Gaz.*, 103 (1942), No. 4, pp. 684-697, figs. 20).—When

cucumber seedlings were cultured in sand at high and low N levels during several different seasons of the year and inoculated at various ages with a *Pythium*-type fungus, the young seedlings proved more susceptible than the older ones. Those grown under the relatively poor light of winter remained susceptible longer than those grown under the good light conditions of spring and early summer. Seedlings grown with no external supply of N remained susceptible to infection longer than those supplied with a complete nutrient solution. Resistance to infection was accompanied by a deposition of lignin in the cell walls of the tissue surrounding the area of infection, and susceptibility was accompanied by incompleteness or absence of this lignification. It is suggested that such lignification, when continuous, may serve as a barrier to the spread of the pathogen. Deposition of lignin was found to be a function of living parenchymatous cells and to occur in the vicinity of a wound or of fungus infection. In a healthy plant these cells did not become lignified. There are 25 references.

Resistance to mosaic virus in the cucumber, O. SHIFFRIS, C. H. MYERS, and C. CHUPP. ([N. Y.] Cornell Expt. Sta.). (*Phytopathology*, 32 (1942), No. 9, pp. 773-784, figs. 4).—In this preliminary report the genetic control of virus symptoms in the cucumber and criteria for measuring resistance are discussed. In understanding the mechanism involved, two developmental phases are distinguished, viz, the cotyledon and the composite true-leaf stages. Three complementary genes apparently control the ability or the failure to produce chlorosis at the cotyledon stage, the genetic ratio in F_2 being 27 nonchlorotic to 37 chlorotic. This ratio is constantly changing at the composite true-leaf stage, where several gene modifiers also take part in the genetic control of virus symptoms. Thus, the frequency of symptomless plants here is very low. The presence or absence of chlorosis on the cotyledons determines whether the tested plant is susceptible or tolerant to mosaic. The degree of tolerance can be determined by the severity or mildness of symptoms and by the relative distance from the inoculated cotyledons to the true leaf on which symptoms first appear, the greater the distance the higher being the resistance. All resistant stocks possess the three basic dominant genes. They vary among themselves in the relative number of dominant modifiers. Suggestions to breeders are included.

A study of spreaders for use on hops in the field control of downy mildew, G. R. HOERNER. (Oreg. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 9, pp. 820-823, figs. 2).—The author presents a study of spreaders for use with fungicides in spraying hops against downy mildew (*Pseudoperonospora humuli*). Laboratory apparatus devised for comparing various spreaders is described. The lowest effective dilutions of 36 spreaders are presented, and a field formula for rosin-soap, one of the most promising, is given.

Distribution and relative importance of various fungi associated with pea root-rot in commercial pea-growing areas in New York, O. A. REINKING (*New York State Sta. Tech. Bul.* 264 (1942), pp. 43, figs. 12).—Isolations and microscopic examinations indicated that practically all root rot organisms reported on peas in this and other countries are widely distributed in the older pea soils of western New York. The following fungi, listed in order of importance, were found primarily responsible for pea diseases in the State: *Fusarium solani martii* f. 2, *Aphanomyces cuteiches*, *Pythium ultimum*, *Rhizoctonia solani*, and *Ascochyta pinodella*. None of the other fungi commonly associated with root rot caused serious disease either under greenhouse or field conditions. The destructive organisms and disease were found in a wide range of soils at pH 6.25-7.48 and in a few soils at pH 5.4 and 5.5. *F. solani martii* f. 2, *P. ultimum*, and *R. solani* were found to be indigenous to certain virgin pea soils. The first two multiplied in the soil with repeated pea plantings, the severity of root rot apparently depending on the build-up of destructive fungi.

A 6-yr. study of fields on the station's canning crops farm at Geneva where peas have been grown in rotation for 16 yr. showed that the important root rot organisms were not entirely eliminated by a 3-, 4-, or 5-yr. rotation. Nevertheless, profitable yields were obtained during favorable growing seasons on the sufficiently fertilized fields in spite of the presence of pathogens. One strain of *F. solani martii* f. 2 isolated from root rot in California red kidney bean proved extremely pathogenic to peas and capable of attacking and living as a weaker parasite on various dry beans. The latter, therefore, should be excluded from a rotation where peas are to be planted. There are 27 references.

Notes on the influence of microorganisms on growth of squash plants in water culture with particular reference to manganese nutrition, H. A. BARKER and T. C. BROYER. (Univ. Calif.). (*Soil Sci.*, 53 (1942), No. 6, pp. 467-477, figs. 2).—Squash plants grown in Mn-deficient solution cultures exhibited typical deficiency symptoms whether or not the roots were sterile. Highly contaminated soil-inoculated plants were usually smaller and less healthy than those with sterile root systems, whether grown in "complete" or Mn-deficient nutrient solutions. The influence of micro-organisms was first manifested by root injury, but very soon the whole plant became affected. The relation of these phenomena to the trace-element deficiency symptoms of plants grown on certain disease-producing soils is not yet clear. Heavily contaminated excised roots had a consistently higher respiratory rate than comparable sterile roots. The relative O₂ deficiency that may result under certain conditions from the greater O₂ consumption of contaminated roots may play a role in root injury, but other undefined factors are believed more important. The apparent Fe requirements of sterile plants are smaller than those of heavily contaminated plants. This is believed due to two factors, viz, the pH of culture solutions in which sterile plants are grown tends to be lowered rather than raised as with contaminated plants, and the organic radical of the Fe salt is not decomposed. Excised sterile roots produced about one-third as much CO₂ anaerobically as aerobically. The comparative behavior of sterile and contaminated roots indicated that CO₂ produced anaerobically by the latter is largely due to the plant component of the plant-microbe system.

Relative resistance of tomato varieties, selections, and crosses to defoliation by *Alternaria* and *Stemphylium*, C. F. ANDRUS, G. B. REYNARD, and B. L. WADE (U. S. Dept. Agr. Cir. 652 (1942), pp. 23, figs. 6).—The preliminary results are presented of an extended breeding project planned to develop tomatoes resistant to defoliation diseases, the methods described including field grading of a large number of hybrid populations, commercial varieties, and foreign introductions. An efficient inoculation technic, involving use of finely cut mycelium, was developed and used for testing large numbers of plants under controlled greenhouse conditions for resistance to early blight (*A. solani*) and gray leaf spot (*S. solani*), considered the most important leaf spot diseases in the southeastern United States and among the outstanding causes of defoliation. All varieties proved susceptible to early blight, but when the severity of infection was adjusted at a suitable level by dilution of the inoculum, significant degrees of tolerance were found in selections of the currant tomato (*Lycopersicon pimpinellifolium*) and in *L. peruvianum*, and to a lesser extent in certain commercial tomato varieties. Outstanding resistance to gray leaf spot was found in selections of *L. pimpinellifolium* and in its hybrids with the common tomato. Many selections resistant to gray leaf spot were also resistant to *Fusarium* wilt and some of them showed significant tolerance to early blight. No large-fruited resistant segregates were obtained from crosses of *L. pimpinellifolium* with large-fruited tomatoes, but many selections were intermediate in size and are a definite advance toward commercial types. In the hybrid progenies examined there were no significant

correlations in resistance to *Stemphylium* and to *Alternaria* as indicated by inoculations, but in trials with varieties and P. I. accessions, significant correlations were usually found.

Gall formation by *Phytomonas tumefaciens* extract and indole-3-acetic acid in cultures of tomato roots, B. A. FRIEDMAN and T. FRANCIS, JR. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 9, pp. 762-772, figs. 4).—When excised tomato roots were cultured in 125-cc. Erlenmeyer flasks containing 50 cc. of P. R. White's yeast extract (E. S. R., 72, p. 185) or synthetic media, addition of ether extract of 6.5 l. of potato-dextrose broth in which *P. tumefaciens* had grown for 3 days reduced growth, caused excess root-hair development, and resulted in swellings of cut ends of some roots. Roots grown in solution to which indole-3-acetic acid ($10\text{--}0.0125$ mg./l.) had been added responded by gall formation. The tumors were characterized by hypertrophy, stimulation of root primordia, hyperplasia, occasional multinucleate cells, excess root-hair production, and callus formation. Galls were formed only in those concentrations of indole-3-acetic acid causing growth inhibition. Up to dilutions of about 7 by 10^{-8} moles/l., indole-3-acetic acid reduced root elongation, number of rootlets, and total dry weight. Concentration of 10^{-10} , 10^{-12} , and 10^{-14} M did not appear to accelerate root growth.

Wound dressings on apple trees, J. S. COOLEY (U. S. Dept. Agr. Cir. 656 (1942), pp. 19, figs. 6).—In an attempt to discover treatments that did not kill the cambium around wounds and the effects of season of wounding on the healing of wounds, a large number of dressings were tried and the most promising were later tested on mature apple trees in Oregon and Virginia. These included white lead and linseed oil, shellac, and two waxlike dressings, one (No. 541) containing 8 parts by weight of rosin and 3 of sardine oil and the other (No. 540) copper soap in addition. Healing was more rapid transversely than longitudinally, in the latter case wounds enlarging even where the best dressings were used. Wounds made in June or later produced little or no callus, enlargement due to death of tissues taking place in both directions. Longitudinal extensions of wounds made in winter was usually greater than in those made in spring. The slightly injurious dressings caused less killing when applied in spring than at any other time. Shellac gave the best callus formation and less dying or longitudinal wound extension than any other dressing tried, and No. 541 gave better healing in general than white lead and linseed oil or No. 540. Untreated wounds usually healed better than those treated with white lead and linseed oil, but poorer than those treated with shellac. For combined wound and woolly apple aphid protection, dressing No. 541 is recommended. In case the best approved materials are not available under existing war priorities the latest information should be sought. A wound dressing only slightly toxic may have injurious effects on apple tree wounds, and the hazard of the treatment might be even greater than that of possible heart rot injury. There are 16 references.

A progress report on the yellow-leaf disease of sour cherry, E. J. RASMUSSEN and D. CATION. (Mich. Expt. Sta.). (*Amer. Pomol. Soc. Proc.*, 57 (1941), pp. 133-140).—Yellow leaf, present in Michigan for at least 20 yr., is a slow-acting disease of considerable economic importance because it causes premature defoliation, progressive reduction in spur growth, reduced yields, and shortening of the profitable life of the orchard. It is a virus disease transmissible by budding, and sprays, fertilizers, or cultural practices are of no avail in eliminating it. Its apparent orchard spread varies from year to year, but the mechanism of spontaneous transmission is unknown, though some evidence points to leafhoppers as possible vectors. Montmorency cherry

selections appear to vary in susceptibility. Nursery tree propagation from healthy high-producing strains or selections promises to become an important control measure.

Prune dwarf, E. M. HILDEBRAND. (Cornell Univ.). (*Phytopathology*, 32 (1942), No. 9, pp. 741-751, figs. 5).—Originally found only in Niagara County, N. Y., prune dwarf is now also known in Canada. Since both Bradshaw and Damson plums were found to be symptomless carriers, the virus may be more widespread than is realized. The disease spreads slowly and, ordinarily, to the immediately adjacent trees in orchards in spurts which have been correlated with severe green plum aphid infestations, but insect transmission tests have been negative. Yields on the prune types of plums average less than 10 percent of normal. The Lombard plum, which suffers foliage symptoms but not abortion of the pistils, yielded slightly below normal, apparently because of the reduced foliage. Fruiting of the Damson plum, which masked symptoms, seemed to be normal.

The only essential for successful transmission to susceptible plants was tissue union between scion and stock, and the shortest incubation period for prune was 5 weeks. Of the *Prunus domestica* varieties tested, only Lombard plum (besides the prune types) developed typical foliage symptoms. None of the *P. salicina* varieties developed marked symptoms, but a distinct chlorotic line pattern virus was prevalent in Red June and also present in Abundance. The Damson plum (*P. insititia*), though failing to develop typical foliage symptoms, was, subsequent to budding, found to contain the virus. Transmission tests from prune to cherry have all been negative, but the peach proved susceptible with production of foliage symptoms from which the trees largely recovered as the season advanced. Peach fruits on affected trees were retarded in development, especially on the suture side. The symptoms appearing in both outdoor and greenhouse tests with Elberta peaches were a stunting of terminal growth and a tendency toward wavy margins on some of the leaves, but the following year the affected peaches had largely recovered. Studies are under way to determine whether any relation exists between prune dwarf and peach-rosette mosaic.

Infection of perennial delphiniums by California-aster-yellows virus, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 14 (1942), No. 8, pp. 411-440, pls. 8).—Among the virus diseases of perennial delphiniums, the one under discussion was found due to the virus of California aster yellows. The delay in discovery of its identity was caused by the fact that the short-winged aster leafhopper (*Macrostelus divisus*) rarely recovers this virus from infected delphiniums, the latter being unfavorable food plants for both the long-winged and short-winged aster leafhoppers. The mountain leafhopper (*Thamnotettia montanus*) and the geminate leafhopper (*T. geminatus*) proved the most important vectors to delphinium, and both species breed normally on this host plant. The main abnormalities induced by the virus in delphiniums are described. The incubation periods in seedlings of four varieties infected during June by four vectors averaged 19.5 days; in plants infected during the second year in February, March, and April before appearance of the spikes they averaged 43.5 days, and after the spikes appeared 45 days. So far as determined the range of the California-aster-yellows virus includes Oregon, Washington, Utah, Wyoming, and Colorado. The disease of delphiniums resembling aster yellows is known in Oregon, Washington, Utah, and Idaho, where either the mountain or the geminate leafhopper or both are known to occur. There are 38 references.

Celery calico on perennial delphiniums and certain other host plants, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 14 (1942), No. 8, pp. 443-464,

pls. 6).—This disease proved due to the celery calico virus. In delphiniums the symptoms were confined to the basal and intermediate leaves and were variable, including pale-yellow, amber, or lemon-yellow areas, or line or ring patterns, but not abnormal flowers or breaking in their color. The incubation period was 11–178 days. Plants spontaneously or experimentally infected during the first year may be symptomless carriers during the second year. Calico is often found associated with aster yellows in delphiniums, but the inoculum from such plants induced calico rather than aster yellows. The aster-yellows virus was recovered from the virus complex by three species of leafhoppers. Tomatoes are sometimes infected with a mixture of viruses. Cucumbers, when inoculated with the virus extract, filtered out ordinary tobacco mosaic virus and retained the calico virus. Aphids of nine species were shown to be vectors of calico virus.

Perennial-delphinium ringspot, H. H. P. SEVERIN and R. C. DICKSON (*Hilgardia* [California Sta.], 14 (1942), No. 8, pp. 367–490, *pls. 4, figs. 4*).—Perennial delphinium was found spontaneously infected with an undescribed ring spot virus the host range of which as determined by mechanical inoculation included 11 species of 8 genera in the 5 plant families Ranunculaceae, Chenopodiaceae, Malvaceae, Solanaceae, and Cucurbitaceae. Plants proving nonsusceptible on inoculation included 28 species of 26 genera in 12 families. Thermal inactivation of the virus occurred at 65° C. for 10 min. Inactivation also took place after extracted juice from diseased cucumber plants had been exposed to the air at room temperature for 5 days, and the tolerance to dilution from delphinium or cucumber was 1:1,000. All attempts to find a vector failed.

Some species of Papulaspora associated with rots of gladiolus bulbs, H. H. HORSON (*Mycologia*, 34 (1942), No. 4, pp. 391–399, *figs. 2*).—As associated with gladiolus bulb rots, the author isolated *P. dodgei*, *P. rubida*, *P. appendicularis* n. sp., and *P. coprophila*. These fungi are saprophytic on bulb tissues rotted by primary infection of some other organism, in this case *Sclerotinia* (*Botrytis*) sp. A note by D. H. Linder is appended in which *P. dodgei* n. sp. is proposed to replace the name *P. gladioli* (E. S. R., 87, p. 381), which had been previously used for another fungus.

Specificity of pyridoxine for Ceratostomella ulmi, W. J. ROBBINS and R. MA (*Bul. Torrey Bot. Club*, 69 (1942), No. 5, pp. 342–352, *figs. 5*).—The effects of 12 analogs of pyridoxin on the growth of *C. ulmi* were determined in agar culture, the diacetate and triacetate of vitamin B₆ proving as beneficial as pyridoxin. Of the 10 additional analogs, 4 had 5 percent or less of its beneficial effect, 2 were inactive, and 4 inhibited growth more or less. Pyridoxin was found to antagonize the detrimental analogs. The possibility of investigating its analogs as an aid in controlling the Dutch elm disease is briefly discussed. There are 12 references.

The variability in resistance to decay of the heartwood of home-grown western red cedar (*Thuja plicata* D. Don.) and its relation to position in the log, K. ST. G. CAETWRIGHT (*Forestry*, 15 (1941), pp. 65–75, *figs. 4*).—Resistance to decay of home-grown timber of this tree was found to be of the same order as that of the imported. The heartwood from the base of a tree about 65 yr. old grown in Scotland showed little variation across the trunk in resistance to attack, the timber from this region being very resistant. There was, however, an indication that the outer wood is more resistant to *Polystictus versicolor* than that next the pith. It is believed probable that this variation would be more marked in a mature tree. The difference in resistance to decay of the wood across the trunk was highest in material taken from the base of the tree, and showed a progressive decrease upwards. This was true for both white and brown rots, but was exhibited most clearly by *Poria incrassata* (brown rot), which appears to be more sensitive to variations in resistance. The

amount of material soluble in hot water was determined in samples from different positions in the trunk, and the toxicity of these extracts to *Pomox annosus* was examined. In each of the cross sections studied, it was noted that the amount of material extracted by hot water was greater in the outer heartwood adjoining the sapwood than in the central heartwood and that the toxicity of the extracts was correspondingly higher. The resistance to decay of the samples thus appeared to be closely correlated with the amount of extractable substances present therein. In the material examined serious decay occurred only in wood containing less than 5 percent by weight of hot-water extractives.

A cedar seedling blight in Puerto Rico, L. A. ALVAREZ GARCÍA. (P. R. Univ. Expt. Sta.). (*U. S. Dept. Agr., Forest Serv., Caribbean Forester*, 1 (1940), No. 2, p. 26, *Span. abs.*, p. 26).—A note reporting *Phyllachora balansae* as causing severe seedling blight on the timber tree *Cedrella mexicana*, apparently new to Puerto Rico.

Cytospora abietis, the cause of a canker of true firs in California and Nevada, E. WRIGHT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 3, pp. 143–153, figs. 3).—In 1929 this canker was first observed extensively on white fir (*Abies concolor*) and red fir (*A. magnifica*) in the northern Sierra Nevada forests, and studies thereon were begun the ensuing year. Typical symptoms include early resin infiltration of the bark, followed by canker development and production of yellow spore horns. Infections on white fir begin in the lower branches and may gradually progress into the stem and upward. On red fir, infections are commonly associated with mistletoe hypertrophies. Slit inoculations were generally unsuccessful, much better results being obtained by a cork-borer method. Cross-inoculations with isolates from either host attacked both, and there seemed to be no significant difference in the virulence of "strains." The fungus is classed as a semiparasite, usually infecting through wounds. Diameter-growth comparisons from increment borings in healthy and attacked trees suggested that drought may be an important factor, particularly in weakening fast-growing white firs previous to infection. Fire-scorched trees appear to aid in perpetuating *C. abietis* between droughts. Other agents, such as bark beetles, aphids, and ants are believed to spread the disease locally and predispose individual branches to infection. The fungus is apparently endemic in the Sierra Nevada forests and assumes epidemic proportions only when the true firs are weakened by environal or other factors. There are 13 references.

Experimental autoccism and other biological studies of a gall-forming Peridermium on northern hard pines, M. A. MCKENZIE. (Mass. Expt. Sta. et al.). (*Phytopathology*, 32 (1942), No. 9, pp. 785–798, figs. 2).—From *Pinus banksiana* and *P. rigida*, inoculations were made on *P. sylvestris*, *P. banksiana*, and *P. rigida* with aeciospores (binucleate) of a gall-forming *Peridermium*, presumably referable to *Cronartium quercuum*. The mycelia giving rise to the aecia bearing the spores were uninucleate. Germination of aeciospores always showed them to form germ tubes, and no basidia or secondary spores were observed. Inoculations were successful on all the hosts, but only on *Pinus sylvestris* inoculated with aeciospores from *P. banksiana* were galls formed. No aecia or pycnia appeared on these galls. On all pine species inoculated with aeciospores from all collections, numerous cases of slight roughening, swelling, or discoloring of the bark (not resulting in gall formation) were observed. Studies of discolored bark showed the presence of typical rust mycelia and haustoria. Microchemical tests of infected trees indicated certain differences among the various plants after infection, but no significant differences were apparent prior to infection. In some infected trees bark discoloration, abundant mycelia, haustoria, galls, and witches'-brooms were observed; in others defoliation and death of leaders or complete necrosis resulted. There are 44 references.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in economic zoology and entomology by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 48-50, 73).—A progress report (E. S. R., 87, p. 85) noting work by L. Haseman, W. W. Smith, L. Jenkins, H. E. Brown, C. W. Wingo, and E. M. Funk on strawberry insects and their control, studies with insecticides, control of the squash bug and cucumber beetle, the periodical recurrence of insect pests, the artificial propagation of game birds, and increasing the egg production of chukar partridges by artificial lighting.

Control of the brown snail in citrus orchards, H. C. LEWIS and J. R. LA FOLLETTE (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 359-362).—In tests made of poison baits consisting of bran, or substitutes, with calcium arsenate or metaldehyde, alone or in combination, for the control of the European brown snail *Helix aspersa* Müller in California citrus orchards, arsenical baits were somewhat more effective than metaldehyde baits. "Metaldehyde baits are relatively ineffective when broadcast and are less effective during cold weather. When used they should be placed in small piles in the sunshine. The season for best control is rainy weather in late winter and spring when snails are most active. Arsenical baits should be broadcast onto the trees, and this method of application is essential during the period when greatest tree damage is being done by immature snails. Fresh-pressed orange pulp, a citrus byproduct, with calcium arsenate is the most effective bait yet tried."

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 449-462, figs. 9).—Contributions presented (E. S. R., 87, p. 821) are: Control of the Striped Blister Beetle [*Epicauta lemniscata* F.] Through Its Gregarious Habits, by W. R. Horsfall (p. 449) (Ark. Expt. Sta.); Killing Codling Moth Larvae With Low Temperatures, by L. Haseman (pp. 449-450) (Mo. Sta.); Sprays to Kill Overwintering Codling Moth Larvae, by M. A. Yothers, F. W. Carlson, and C. C. Cassil (pp. 450-451); Toxicity of Trichloroacetonitrile to the California Red Scale, by R. L. Busbey, H. R. Yust, and R. A. Fulton (pp. 452-453); Notes on the Biology of the Citrus Thrips, by F. Munger (p. 455), and Insect Pests Breeding in Vegetable Refuse in Arizona, by C. C. Deonier (pp. 457-458) (all U. S. D. A.); A Natural Habitat for the Black Carpet Beetle, Attack of the Lead Cable Borer on Asphalt Roofing Material, and Wood-Boring Habit of the Drugstore Beetle [Weevil], all by E. G. Linsley (p. 452) (Univ. Calif.); An Unusual Injury to Peas by Thrips [*Frankliniella helianthi* (Moult.)], by P. T. Rihard (p. 453), and *Orius insidiosus* [Say], a Predator on Cotton Insects [Cotton Flea Hopper, Bollworm, and Cotton Leafworm] in Western Texas, by W. S. McGregor (pp. 454-455), (both Tex. Sta.); Observations on the Relationship of Alsike Clover Nectar to Relative Humidity, by H. A. Scullen (pp. 453-454) (Oreg. Sta.); Transmission of the Causal Agent of the Ring-Rot Disease of Potatoes by Insects, by G. M. List and W. A. Kreutzer (pp. 455-456) (Colo. Sta.); The Larval Meconium of Parasitic Hymenoptera as a Sign of the Species, by S. E. Flanders (pp. 456-457), and Analytical Isolation of Rotenone From a Spray Solution, by F. A. Gunther (p. 458) (both Calif. Citrus Sta.); Control of *Brachyrhinus sulcatus* Fab. in Southern California, by D. B. Scott, Jr. (pp. 459-460); The Prickly Pear Cactus Thrips *Rhopalothrips bicolor* [Hood], by S. F. Bailey (pp. 460-461) (Univ. Calif.); and The Block Method of Mounting Insects, by F. E. Guyton (pp. 461-462) (Ala. Polytech. Inst.).

[Insect investigations by the Arkansas Station] (*Arkansas Sta. Bul.* 417 (1942), pp. 34-41).—A progress report noting work by D. Isely, W. R. Horsfall, and W. J. Baerg with the boll weevil, cotton aphid, cotton leafworm, bollworm, common red spider, and cotton flea hopper, as well as control for the striped blister beetle, grape rootworm, and fall armyworm.

[Insect investigations by the Nebraska Station]. (Partly coop. U. S. D. A. et al.). (*Nebraska Sta. Rpt. [1941], pp. 45-50, figs. 2*).—A progress report noting work by H. D. Tate, R. Roberts, and R. E. Hill on the hessian fly, chinch bugs, grasshoppers, corn earworm, southern corn rootworm, potato flea beetles, potato psyllid, *Lygus* spp. on potatoes, Colorado potato beetle, potato leafhopper, and cockroach and ant control.

[Entomological investigations by the Texas Station]. (Partly coop. U. S. D. A., Iowa and Wyo. Expt. Stas., et al.). (*Texas Sta. Rpt. 1941, pp. 19-20, 21, 29-38, 56, 160-161, 163, 164-165, 166, 182*).—Included are brief reports (E. S. R., 86, p. 213) on studies at the station and substations by H. B. Parks, A. H. Alex, H. J. Reinhard, F. L. Thomas, J. C. Gaines, Jr., W. L. Owen, Jr., J. N. Roney, R. K. Fletcher, S. E. Jones, A. J. Chapman, V. A. Little, S. W. Bilsing, W. S. McGregor, M. J. Janes, and P. T. Rihard on the activities of bees; queen rearing; queen rearing for resistance to American foulbrood; biology, control, and taxonomy of white grubs (*Phyllophaga* spp.); cotton insects, including the boll weevil, cotton flea hopper, bollworm, flower thrips, *Adelphocoris superbus*, *Lygus hesperus*, *Chlorochroa ligata*, rapid plant bug, southern green stinkbug, vegetable weevil, and the pink bollworm; devil's shoestring as an insecticide; fruit and nut insects, including the pecan nut casebearer, plum curculio, oriental fruit moth, and bark beetles (*Stephanoderes fleus* Hopk.); truck crop insects, including the cabbage looper, flea beetle *Phyllotreta vittata discedens* (Wise), turnip aphid, and squash bug; sulfur injury to potatoes; thrips on roses; the leaf crumpler; control of leafhoppers and the grape berry moth on grapes; incidence of citrus insects; Florida red scale; population studies of citrus rust mites; cabbage webworm; harlequin bug; garden flea hopper of tomatoes; tomato fruitworms on beans; corn earworm; onion thrips; and wingless May beetles.

Notes on the temporary establishment of insect and plant species on Canton Island, R. H. VAN ZWALUWENBURG (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 46 (1942), No. 2, pp. 49-52, fig. 1*).

Insect pests of stored rice and their control, A. I. BALZER (*U. S. Dept. Agr., Farmers' Bul. 1906 (1942), pp. [2]+22, figs. 16*).—The most destructive insects to rough rice are the angoumois grain moth, the lesser grain borer, and the rice weevil. Several other species are of some importance. More important milled rice pests are the saw-toothed grain beetle, red flour beetle, confused flour beetle, cadelle, flat grain beetle, Indian-meal moth, rice moth *Corcyra cephalonica* (Staint.), corn sap beetle, psocids, lesser grain borer, and the rice weevil. Rice may become infested in the field, in farm storage, warehouses, elevators, and in transit. Control measures discussed include the use of hydrocyanic acid, methyl bromide, chloropicrin, and ethylene oxide as fumigants; mill and warehouse sanitation; and heating and drying; as well as sprays and dusts.

Pantry insects, J. B. SCHMITT (*New Jersey Stas. Cir. 441 (1942), pp. [2]*).

Insect food caches as reservoirs and original sources of some stored products pests, E. G. LINSLEY. (Univ. Calif.). (*Jour. Econ. Ent., 35 (1942), No. 3, pp. 434-439*).—The known occurrence of stored products pests and certain other household pests in the nests of bees and wasps and the importance of such foci as sources of infestation led to the examination of eight nesting sites of five species of *Anthophora* in seven localities in central and southern California. Dermestids of several types were abundant in all of the sites; the California spider beetle *Ptinus californicus* Pic and the confused flour beetle were present in three; the Indian-meal moth, the drugstore weevil, and the black flour beetle *Aphanotus parallelus* Csy. in two; and the saw-toothed grain beetle and the webbing clothes moth, each in one site. In a single colony on the edge of the Mojave Desert, approximately 10 miles from the nearest human habitation, the

drugstore weevil, the saw-toothed grain beetle, and one of the so-called cabinet beetles, *Trogoderma faja* Csy., were found, and in a second area, only slightly less isolated, the Indian-meal moth and the webbing clothes moth were both present. This brief report is followed by a review of the present knowledge of such occurrences, presented with a list of 59 references to the literature cited.

Variations in tolerance of narcissus bulbs to hot water-formalin treatment associated with locality of production or of storage, C. F. DOUCETTE. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 403-405, fig. 1).—In order to determine the influence of differences in environment, bulbs from distinct regions in the Pacific Northwest were used in comparing the effects of hot water-formalin treatment for the control of bulb pests. "The treatment consisted of presoaking in water at 75° to 80° F., followed by immersion for 4.5 hr. in water at 111° containing formalin at a dilution of 1:400. The similarity of response of all lots following early season treatment, 6 to 8 days after digging, indicated that no important variation was associated with growing conditions of the localities. The bulbs stored at the several localities until treatment given near the end of the storage season varied considerably in their response, exhibiting decreased tolerance as the locality shifted from south to north."

The determination of kerosene oil deposit on citrus leaves, F. A. GUNTHER and W. EBELING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 333-339, figs. 4).—Account is given of a new method for determining the amount of kerosene deposited on citrus leaves by toxic kerosene sprays. This method involves the selective chemical disintegration of the leaf cells, accompanied by a steam distillation of the stable oils present. The apparatus necessary for this method is described in detail. Typical results obtained when the method was applied to field experiments are presented. In one such experiment the coefficient of variation of this method was determined to be 0.0467. The only probable source of error is discussed. It is shown that the major portion of the kerosene "absorbed" by the leaf probably goes into solution in the natural waxes and oils elaborated inside the leaf cells.

Some observations on oil deposit, H. KNIGHT (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 330-332, figs. 3).

The New Caledonian cockroach wasp *Ampulex compressa* in Hawaii, F. X. WILLIAMS (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 2, pp. 43-48, figs. 6).—Biological notes on this beneficial wasp, recently introduced into Hawaii from New Caledonia, are presented.

A method for rearing citrus thrips in the laboratory, F. MUNGER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 373-375, figs. 3).—A technic developed for the rearing of thrips in the laboratory for toxicological tests, in which use is made of a cage consisting of two sheets of glass with oval holes cut therein and separated by an oval ring of plaster, is described. The upper surface of a citrus leaf is sealed against the opening in one of the sheets of glass and the other surface is placed in contact with a moist pad.

Calcium cyanamid, a possible practical control for pear thrips in prune orchards, E. P. BREakey. (West. Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 376-382, figs. 4).—The timely application of pulverized and oiled calcium cyanamide (5 percent oil) of commercial grade to the surface of the soil in prune orchards at the rate of 300 lb. per acre or less reduced the number of overwintering thrips to emerge from the soil by approximately 90 percent. Large-scale applications of calcium cyanamide dust were made in the prune orchards of Clark County, approximately 300 acres having been dusted in the spring of 1941. The dust was applied in two applications of 150 lb. each, the initial application being timed for maximum effectiveness against the thrips

and the second application made approximately 10 days later in order to prevent the development of the apothecia of the brown rot fungus. Blossom counts made over treated and untreated areas at the close of the emergence period of the thrips indicate results in keeping with those obtained experimentally.

The grape or vine thrips, *Drepanothrips reuteri*, S. F. BAILEY. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 382-386, figs. 4).—Account is given of the economic importance and biology of *D. reuteri* Uzel, together with notes on other species of thrips on grapes. So far it has been unnecessary for growers to practice specific control measures, since the contact sprays and dusts of oil, pyrethrum, and nicotine used for the grape leafhopper considerably reduce the thrips population. A spray composed of 2 lb. of tartar emetic and 4 lb. of sugar per 100 gal. of water is said to give a remarkable kill of adults and larvae. When necessary, such a spray applied in May or June will prevent further injury to young shoots and berry clusters. A list is given of 23 references to the literature cited.

Evaluating the economic status of Phymata, W. V. BALDUF. (Univ. Ill.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 445-448).—An appraisal of the economic role of the common ambush bug *P. pennsylvanica americana* Melin on the basis of 832 prey records obtained in the field near Urbana, Ill., in the years 1938, 1939, and 1940, is reported. This is followed by a discussion of the obstacles encountered in attempting such an evaluation of this form and which will presumably be met also, more or less, in similar attempts on any other insect.

Lime zinc spray as a repellent for leafhoppers on citrus, H. C. LEWIS (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 362-364).—In combating the potato leafhopper, which has become an important pest of citrus in the San Joaquin Valley of California, injury being caused to ripening oranges through puncturing of the rind of the fruit resulting in a blemish, a light whitewashing composed of zinc and lime has been used for several years and is effective in repelling the migrating adults. Only overwintering adult leafhoppers are present during the winter months when injury takes place. No immature forms of this pest occur on citrus.

Trap-light studies on leafhoppers of the genus *Empoasca* (Homoptera: Cicadellidae), 1932-1941, N. H. WHEELER. (U. S. D. A.). (*Ent. Soc. Wash. Proc.*, 44 (1942), No. 4, pp. 69-72).—Operation of trap lights at the Arlington Experiment Farm, Arlington, Va., over a period of 10 yr., for the purpose of collecting leafhoppers of the genus *Empoasca* is reported upon. During this period a total of 60,938 specimens was collected, of which 26,062 were females and 34,876 males. A total of 30 species was collected, 21 being the maximum number obtained during a single season. *E. fabae* (Harris), represented by 24,953 males, was followed by 4 species represented by more than 200 specimens (males), namely, *E. erigeron* DeLong 2,685, *E. pergandei* Gillette 558, *E. albocurva* Gillette 239, and *E. solana* DeLong 201.

Biology and control of *Empoasca filamenta*, H. C. MANIS and E. L. TURNER. (Idaho Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 416-418).—In the study reported 14 wild plants and numerous farm and garden plants were found to be suitable hosts for the leafhopper *E. filamenta* DeL., which occurs abundantly on potatoes in Idaho and for which the common name intermountain potato leafhopper is suggested. The average incubation time for eggs of the leafhopper was 12 days. The average length of time for nymphal development was 16 days. There are three and a partial fourth generations each season. Pyrethrum-cube-talc dust and pyrethrum extract-lime-sulfur spray were effective in controlling *E. filamenta*. Bordeaux mixture and the dusts containing sulfur, which control the potato leafhopper, do not control *E. filamenta*. Cube-talc dust and lime-sulfur spray also did not control this leafhopper, but it does

very little injury to the foliage and is not responsible for reduced yields in potatoes, since no increase in yields was obtained on plats where it was controlled.

Time of seeding as a method of control for the pea aphid on fall-sown legumes in the Pacific Northwest, L. P. ROCKWOOD and M. M. REEHER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 420-423).—The recommended means of control of the pea aphid on fall-sown legumes in Oregon and Washington is that common vetches and Austrian Winter field peas for seed be sown in well prepared ground that is free from earlier self-sown annual legumes, about October 20 and not before October 16, and that hairy vetch for seed be sown not earlier than October 11. If late seeding is to secure its maximum effect in reducing aphid abundance, cover crops and green manure crops should be plowed under by April 7 (the calculated mean date for first spring flight of the pea aphid is April 7 ± 3 days). This practice would greatly reduce the ever-present threat of aphid damage to fall-sown annual legumes in the western parts of those States.

Life history of *Diaspis boisduvalii* and its control on cattleya with calcium cyanide, R. M. BOHART. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 365-368).—Report is made of a study of the biology of *D. boisduvalii* Signoret, one of the most common pests attacking cattleya and the most abundant and injurious of the several species of scale recorded in California. In the studies conducted in the laboratory at 75° F. and high humidity it was found that the life cycle from egg to adult male averaged 33 days and from egg to egg-laying female 50 days. About 200 eggs were laid by a single female. In a study of population increase on an orchid leaf in the laboratory, approximately 10,000 scales, of which 50 percent were females, were produced over a period of 5 mo. by 7 original specimens. Effective control was obtained by use of dosages of granular calcium cyanide as low as 0.10 oz. per 1,000 cu. ft. Fumigation for 3 successive weeks reduced the scale population by 98.4 percent. A small amount of injury in the form of leaf burn occurred on the older leaves, especially in the slow-growing varieties.

The stupefaction of California red scale with sublethal dosages of hydrocyanic acid, H. R. YUST, H. D. NELSON, and R. L. BUSBEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 339-342).—It was found in laboratory fumigations of nonresistant mature female scales with hydrocyanic acid at 59° F. that exposure to a sublethal dosage for 10 min. immediately before exposure to the lethal dosage produced marked protective stupefaction, but the stupefaction was lost at this temperature when 1 hr. elapsed between exposure to the sublethal and the lethal dosage. At 77° nonresistant mature female scales were not markedly stupefied when exposed to the same sublethal dosage immediately before the lethal dosage, but were stupefied to a significant extent when 1 hr. elapsed between the sublethal and the lethal dosage. In laboratory fumigations simulating conditions in field fumigations resistant mature female scales were stupefied with a 45-min. exposure to a sublethal dosage applied immediately prior to the lethal dosage. The stupefying effect was partly lost in 2 hr. but not completely lost in 3 hr. Under the same conditions scales in the second molt were stupefied with the same sublethal dosage immediately prior to the lethal dosage, and the stupefying effect was dissipated in 2 hr. The stupefactive effect of exposure for three successive 45-min. periods to a sublethal dosage was the same as that of a single 45-min. exposure.

A comparison of the susceptibility of the so-called resistant and non-resistant strains of California red scale to methyl bromide, H. R. YUST and R. L. BUSBEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 343-345).—In experiments with the California red scale the so-called resistant scales in the

mature female stage were also resistant to methyl bromide, and the so-called nonresistant scales of the same stage were nonresistant to methyl bromide, but the difference that existed in the susceptibility between the two strains to methyl bromide was less than the difference that existed between the two strains to hydrocyanic acid. Scales of the so-called resistant strain in the early gray adult stage of development were more susceptible to methyl bromide than scales of the so-called nonresistant strain in the same stage of development in 40-min. fumigations, but not in 120- to 180-min. fumigations. There was no difference in susceptibility of the two strains of scales in the second molt to methyl bromide in the limited number of tests made.

The effect of magnesium deficiency on infestations of purple scale on citrus, W. L. THOMPSON. (Fla. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 351-354, figs. 2).—It was found that purple scale populations on bronzed leaves of citrus, known in Florida as "bronzing" and due to magnesium deficiency, were significantly lower than on green leaves of the same age. Collectively, trees with a high percentage of bronzed leaves were not so heavily infested as adjacent trees with a high percentage of green leaves where the magnesium deficiency had been corrected. Indirect factors influencing lighter infestations on magnesium-deficient trees are sparsely foliated trees and the abnormal dropping of leaves.

Influence of tartar emetic on the yellow scale and its parasite *Comperiella bifasciata* (How.), J. K. HOLLOWAY, C. F. HENDERSON, and H. V. McBURNIE. (U. S. D. A. coop. Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 346-347).—In laboratory work with the yellow scale tartar emetic was found to be toxic to adults of the parasite *C. bifasciata*. In field experiments this insecticide did not influence yellow scale populations, nor were there any significant differences in parasitization by *Comperiella* in the treated and check plats. This has led to the conclusion that as a source of food the deposits are not attractive to the parasites under field conditions.

Sulfur dust as a supplement to cyanide fumigation for control of black scale and its effect on citrus red mite, E. A. MCGREGOR. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 355-358).—It was demonstrated in studies at Placentia, Calif., in 1937-38 and at North Whittier Heights in 1938-40 that two applications of 325-mesh sulfur dust applied during the period of hatching significantly reduced the populations of the black scale. When the sulfur treatments were followed in August by hydrogen cyanide fumigation the populations of mature scales the following spring were materially reduced below the levels occurring the year previous. In most cases where fumigation alone was applied the populations of maturing scales became higher than the year before. Sulfur dust applied during May and June caused very high mortalities of the citrus red mite at Placentia in 1937 and at North Whittier Heights in 1939.

The seasonal vertical distribution of wireworms in the soil in relation to their control in the Pacific Northwest, E. W. JONES and F. H. SHIRCK. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 3, pp. 125-142, figs. 4).—Trends in the numbers of wireworms occurring at different depths in the soil were studied near Walla Walla, Wash., and Parma, Idaho, in relation to soil temperature, moisture, and cropping conditions. From 10 to 20 1-sq.-ft. soil units to a depth of 18 or 24 in. were examined for wireworms on each observation date. It was found that there is an upward migration of wireworms from the subsoil layers to the surface layers in the spring when temperatures range from 40° to 68° F. at the 6-in. depth. Wireworms leave the surface 3 in. and return to deeper layers when surface temperatures of 75° and above are reached. Avoiding seeding early in May, when the highest percentage of wireworms are in the surface 6 in. of soil, tends to minimize the loss of seed of summer crops

from wireworm feeding. The effectiveness of soil fumigants is related to wireworm depth distribution. The application of carbon disulfide would be most effective in July, August, or September, whereas naphthalene would be more effective during April, May, and June. The time to attract wireworms to any form of baits is also during April, May, and June.

The flight of sugar-beet wireworm adults in southwestern Idaho, F. H. SHIRCK. (U. S. D. A. coop. Wash. and Idaho Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 423-427, fig. 1).—Collections of adults of sugar beet wireworms made over a 4-yr. period by the use of standard insect nets have shown the flight period in southwestern Idaho to extend from the middle of April to the end of May.

Will click beetles mate more than once and are they parthenogenetic? C. E. WOODWORTH. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 418-419).—The experiments reported have shown that since the males of the Pacific Coast wireworm can successfully mate several times the practical value of trapping these individuals is lost. This is true even though the females cannot reproduce parthenogenetically.

White grub control with dichloroethyl ether, P. O. RITCHER and H. H. JEWETT. (Ky. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 441-445).—In experimental work conducted, the details of which are presented in four tables, poor control of third instar *Phyllophaga* and green June beetle larvae in bluegrass sod resulted from the use of dichloroethyl ether solution containing 32 cc. of ether per gallon and applied at a rate of approximately 1 gal. per square yard. The same solution, with or without Tergitol 7 penetrant, gave excellent control with one application of 2 to 2.25 gal. per square yard. This dosage gave control of *Phyllophaga* larvae ranging from 65.4 to 99.3 percent with a mean of 81.3 percent. The same dosage gave control of the green June beetle larvae ranging from 67.8 to 93.2 percent with a mean of 79.3 percent. The addition of 0.05 or 0.1 percent Tergitol 7 penetrant caused no significant increase in the percentage of control of either genus of grubs but was beneficial in effecting solution of the dichloroethyl ether. In general, there was no significant difference between the control of *Phyllophaga* and green June beetle larvae effected with dichloroethyl ether and sodium cyanide at optimum dosages. Dichloroethyl ether solution had little or no effect on bluegrass when applied at dosage and strength needed for good control of grubs. Severe injury to spiny sida, dandelions, and small tobacco plants was observed.

Life history and control of the giant apple root borer [California prionus], J. R. EYER (*New Mexico Sta. Bul.* 295 (1942), pp. 14, figs. 11).—This reports a continuation of earlier work (E. S. R., 60, p. 64).

In New Mexico adults of this long-horned beetle emerge from pupae in the soil during the latter part of June and early in July. The apple tree is the preferred host of this species. Most of the feeding by first- and second-year larvae occurs on the surface of the larger roots, which are usually killed by being girdled. At this stage the larvae are often in close contact with the soil and can be easily killed by soil fumigants which possess the property of rapid penetration. Third- and fourth-year larvae usually burrow deeply into the living wood of the crown and are difficult to eradicate. Pupae are vulnerable, since this stage is generally formed in the soil and easily reached by fumigants. Based on observations made during this investigation it was concluded that vigorous apple trees are least subject to attack and trees up to 6 yr. of age may be protected by strawboard bands treated with β -naphthol or α -naphthylamine placed just before adult emergence (June 1) and allowed to remain until August, while older infested orchards should be treated at least every 2 yr. with

paradichlorobenzene at the rate of 1.5 to 2 oz. to a pint of "white" gasoline and applied at the rate of 1 pt. to each foot of tree circumference.

Powder post beetles, J. B. SCHMITT (*New Jersey Stat. Cir.* 442 (1942), pp. [2]).

Spraying and dusting experiments with bush lima beans on Long Island for control of the Mexican bean beetle, H. C. HUCKETT (*New York State Sta. Bul.* 702 (1942), pp. 45, figs. 3).—Results from these experiments, carried on during the seasons of 1936 to 1941, inclusive, indicated that dusting as expressed in yield was inferior to spraying for foliage protection against the Mexican bean beetle. Copper sprays on their own merits were superior to sulfur sprays. Pyrethrum or rotenone when added to copper sprays served to increase slightly their effectiveness in foliage protection. Sulfur sprays were improved by the addition of rotenone as expressed by foliage protection and yield of pods.

Commercial control of the pepper weevil in California, R. E. CAMPBELL and J. C. ELMORE. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 369-373).—Control work with the pepper weevil in southern California in 1941 in which a cryolite-talc-cube dust mixture was used at the rate of 15 to 25 lb. per acre per application, applied with power and hand dusters, is reported. The program recommended, consisting of three dustings at 5-day intervals, starting when the first pods commence to set, a 10-day interval with no dustings, and then three more dustings at 5-day intervals, was followed by many growers, who installed adequate washing equipment so that poisonous residue was successfully removed. In comparing treated with untreated fields, the average number of pods per plant was used, 200 plants per field being examined, with 46 fields included in the survey. The treated fields produced more than three times as many pods as the untreated. Fields dusted six to nine times produced more pods than those dusted two to five times. Late-planted fields were more severely damaged by the pepper weevil than fields planted earlier.

Platynota stultana as a pest of field-grown carnations, R. M. BOHART. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 399-403).—Account is given of the host relationships, an outline of its life history and seasonal history, and control work with *P. stultana* Wlsm., known in the literature as the orange webworm, orange calyx worm, and rose leaf roller, which has a broad host range but in California is responsible for damage chiefly to carnation, rose, and orange. "On carnation it persists throughout the year in cloth houses but is dormant for a few months during the winter. Damage to carnation is of three types, leaf tying, bud boring, and stem boring, in descending order of frequency. At an average temperature of 75° F. the life cycle from egg to adult was found to vary from 43 to 46 days. Six species of hymenopterous parasites were reared in the laboratory, but, except for a short period toward the end of summer, these did not appear to be of much consequence. Materials used in control studies included paris green, acid lead arsenate, pyrethrum-rotenone combinations, cuprous cyanide, natural cryolite, dichloroethyl ether, nicotine-bentonite, and a nitrated phenol. The first three of these had undesirable effects on foliage. The most promising material was natural cryolite, used as a spray at the rate of 6 lb. to 100 gal., applied to 6,000 mature plants."

Variability of diapause in *Melissopus latiferreanus*, S. M. DOHANIAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 406-408).—Of the seven varieties (A to G) of the filbert worm, recognized by taxonomic specialists as due to variability in color, size, and structure, A, B, and C have been found west of the Rocky Mountains and the remaining four east of the Rocky Mountains to the Atlantic coast. Collections from the three Pacific Coast States during the past 4 yr. have shown that variety A infests hazelnuts and oak galls, while

variety C was reared from Catalina cherries, acorns, and filberts. No specimens of other varieties have been reared by the author in that area. In rearings of variety C from the Catalina cherry material from Catalina Island some individuals in the first two collections emerged in time to produce another generation the same season; about two-thirds of the insects collected emerged the following season; seven of the larvae hibernated through two winters before issuing as adults; and three remained in the soil through three winters. The summer-generation larva forms a thin, frail cocoon only sufficiently strong to permit the easy egress of the moth from the pupal shell. However, the cocoons of the overwintering forms are spun finely and closely and are firm, tough, and strong, with particles of soil and gravel adhering all around their exterior. They are impervious to water, and their texture would seemingly protect the enclosed larvae from desiccation in severe or prolonged droughts. A few specimens of variety C that hibernated through two winters were reared from infested acorns and filberts collected in the Willamette Valley in northwestern Oregon.

Efficiency of nicotine sprays for codling moth control in the Pacific Northwest. F. P. DEAN, E. J. NEWCOMER, C. C. CASSID, and C. C. ALEXANDER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 387-392, figs. 3).—The tests reported are considered to show that the standard tank-mix nicotine bentonite would not be a satisfactory substitute for lead arsenate in the control of the codling moth in the Pacific Northwest. Until sufficient tests have been made on a large scale no suggestion can be made for the use of nicotine for combating this pest in that region, with the exception that it might be used in lightly infested areas, particularly in pear orchards.

Studies on the prevalence of the European corn borer in the East North Central States. A. M. VANCE (U. S. Dept. Agr. Cir. 649 (1942), pp. 24, figs. 3).—The European corn borer has spread since 1921 in the East North Central States until by 1939 infestations were found in all of Ohio, much of Michigan, the northeastern half of Indiana, part of eastern Wisconsin and northeastern Illinois, and four counties in northern Kentucky. Fall abundance of this insect in parts of Ohio, Michigan, and Indiana has ranged from an average low of 12.6 larvae per 100 plants in 1934 to a maximum of 111.2 in 1939. Certain corn borers produced two generations in each of the years 1936 to 1939 in parts of Ohio, Michigan, and Indiana. Extreme drought conditions were unfavorable to the corn borer and caused decreases in its population. Probably drought in July was most detrimental to survival. The egg stage and the period of establishment of the first and second instars constitute two of the most critical phases in the life history of this pest. From 53.2 to 95.4 percent of the eggs in a given year and locality hatched normally. In a sweet corn area west of Toledo, Ohio, the average peak of oviposition for a 13-yr. period (1927-39) was July 8-12, and the number of eggs per mass for the 10-yr. period (1930-39) was 16.6.

Experiments for controlling the western peach borer. A. E. MICHELbacher and R. F. SMITH. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 393-398).—The control experiments reported indicate that ethylene dichloride is not as effective against the western peach borer in California as it is against the eastern species. "The work has shown that it is possible to control the borer during the cooler parts of the year with ethylene dichloride at a time when paradichlorobenzene would be ineffective due to the low temperatures. It is very possible that kills obtained in late summer and fall treatments could be increased if the treatment followed an irrigation. If the soil for mounding was moist there is likelihood of it forming a better seal, thus retaining the vapor of ethylene dichloride and resulting in a better kill. The soil moisture content certainly would be more like that found in the South and East and the treatment more comparable. Because the fall treatment with ethylene dichloride emulsion has

not proved greatly superior to the paradichlorobenzene treatment it would seem wise that farmers continue with the latter method of control."

Experiments with poisoned bait to control armyworms in wheat, R. C. DAHMS and F. A. FENTON. (U. S. D. A. and Okla. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 439-440).—It was shown in experiments conducted during a severe outbreak in 6 acres of wheat on the Washita River Bottom near Chickasha, Okla., that poisoned-bran bait spread at the rate of 10 lb., dry weight, per acre was not enough for effective control of the armyworm in that crop. Bait spread at the rate of 20, 30, and 40 lb. per acre gave approximately the same kill, an indication that not over 20 lb. per acre need be applied to kill armyworms in wheat. The insects were killed in a shorter time when 2 qt. of sodium arsenite were used per 100 lb. of bran than when 1.5 qt. were used, but at the end of 72 hr. the mortality was not significantly greater in the plats that received bait containing 2 qt. of sodium arsenite. Eight armyworms per square yard did not injure the kernels, but 42 worms, or more, per square yard injured some kernels. The findings indicate that bait should be applied when the worms are in the early instars, and that if they are not killed until they are nearly mature the reduction in injury to the wheat will be rather small.

Flight and oviposition habits of the Clear Lake gnat, A. W. LINDQUIST and C. C. DEONIER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 411-415, figs. 2).—Observations of the habits of the Clear Lake gnat, a nonbiting midge, which causes considerable annoyance and discomfort to residents along the shores of Clear Lake in Lake County, Calif., as previously reported upon by Herms (E. S. R., 78, p. 80), are presented.

The mosquitoes of the Southeastern States, W. V. KING, G. H. BRADLEY, and T. E. MCNEEL (U. S. Dept. Agr., Misc. Pub. 336, rev. (1942), pp. 96, pls. 6, figs. 26).—A revision (E. S. R., 81, p. 819).

The seasonal distribution of myiasis-producing Diptera, M. A. STEWART and E. B. ROESSLER. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 408-411, fig. 1).—Trap collections of myiasis-producing Diptera at Davis in the southern part of the Sacramento Valley of California, made continuously from November 26, 1935, to December 17 of the following year, are reported upon. The findings indicate that *Phormia regina*, because of its greater abundance over a longer period of time, is the most important myiasis producer in the Sacramento Valley. The secondary screwworm, because of its greater abundance as well as its higher efficiency as a wound invader, becomes the most important myiasis producer during August, September, and the first part of October. The *Lucilia* spp. become most important during the colder part of the year. The screwworm assumes importance in this part of California only in exceptional years.

Histological effects of pyrethrum and an activator on the central nervous system of the housefly, A. HARTZELL and H. I. SCUDDER (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 428-433, figs. 3).—In the histological studies conducted pyrethrum and its activator, isobutyl undecylene amide, each was found to show rather distinct and characteristic effects upon the central nervous system and associated tissues of the adult housefly. Pyrethrum has a widespread clumping effect on the chromatin of the nuclei, while the activator seems to cause a chromatolysis or dissolution of the chromatin. A combination of these two agents (as in Pynin) shows a histological picture that is a summation of the effects of both. The interaction of these two types of nuclear destruction may be the true basis of "activation."

Bee poisoning in Washington, R. L. WEBSTER. (Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 324-326, figs. 2).—Observations conducted in potato fields in Kittitas County in 1940, where many commercial bee yards are

located within easy bee flight of potato fields dusted several times with a cryolite-rotenone dust, failed to reveal any honeybees frequenting the potato foliage and no reported cases of bee poisoning. Similar observations in Yakima County in 1941 also failed to show the presence of bees in the potato fields, although some evidence of bee poisoning was observed in July and was thought to be from sprayed fruit trees although in one case the bees were quite isolated from such trees. On an asparagus planting at Prosser in 1940 honeybees ceased working on asparagus blossoms for pollen about June 20, when the main honey flow started and at a time when the asparagus beetle population began to rise and spraying for the beetles was opportune. In 1941, however, cutting the asparagus continued until a later date. Asparagus bloom furnished pollen until July 1, and bee activity almost coincided with that of the asparagus beetles. It is pointed out that honeybee activity in an asparagus planting appears to depend upon (1) the time when pollen is available and (2) the date of the main honey flow.

The mechanism of colony resistance to American foulbrood, A. W. WOODBROW and E. C. HOLST. (U. S. D. A. coop. Ark., Iowa, Texas, Wis., and Wyo. Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 327-330).—Use was made of a new method for the controlled inoculation of individual honeybee larvae with spores of *Bacillus larvae* in the investigation of the mechanism of resistance to American foulbrood. The disease was produced in the brood of resistant colonies as readily as in that from susceptible ones. All diseased brood was removed by the bees of some resistant colonies before ordinary symptoms of the disease were manifest. In a resistant colony no diseased brood remained long enough to permit the disease organisms to reach the spore stage, whereas in a susceptible colony spore formation occurred in numerous infected larvae. *B. larvae* in the rod stage was found to be noninfective. The data show that resistance to American foulbrood in the honeybee colony consists in its ability to detect and remove diseased brood before the causative organism, *B. larvae*, reaches the infectious spore stage in the diseased larvae.

Royal jelly and bee bread as sources of vitamins B₁, B₂, B₆, C, and nicotinic and pantothenic acids, M. H. HAYDAK and L. S. PALMER. (Minn. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 319-320).—A biological assay made on royal jelly and bee bread showed that the former contains about 50 µg. of pyridoxin per gram of fresh substance and the latter about 5 µg. Microbiological and microchemical determinations revealed the presence of thiamin, riboflavin, ascorbic acid, nicotin acid, and pantothenic acid in both royal jelly and bee bread in various amounts. These variations were greater in bee bread than in royal jelly. The presence of pyridoxin could not be established either in royal jelly or in bee bread by the microchemical method. A table showing the vitamin contents of the royal jelly and the bee bread is given.

The composition of pollens, F. E. TODD and O. BREThERICK. (U. S. D. A. coop. Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 312-317).—Analyses were made of samples of pollen from 32 plant species and 1 uredospore, 6 being hand collected and 27 bee collected. Pollen composition varies greatly, the mean percentages for bee-collected samples being crude protein 21.60, ether extract 4.96, water 11.19, ash 2.70, reducing sugar 25.71, nonreducing sugar 2.71, starch 2.55, and undetermined matter 28.55. Pollen ash showed the following average values: Potassium 20.7, phosphorus 13.6, calcium 10.5, magnesium 6.7, and iron 0.07 percent. As a food material pollen compares favorably in crude protein with alfalfa leaf meal, coconut meal, flaxseed, and navy beans; in ether extract with corn, bran, shorts, middlings, and soybean meal; and in ash with grain and seeds. That the composition of pollen is of interest not only as a bee food but

as a possible apiary product is emphasized, it being estimated that the bee industry could produce 80,000 tons of pollen per year if a market were available.

Orange nectar and pollen in relation to bee activity, G. H. VANSSELL, W. G. WATKINS, and R. K. BISHOP. (U. S. D. A. coop. Univ. Calif. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 321-323, figs. 2).

The pollen required by a colony of honeybees, J. E. ECKERT. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 309-311, fig. 1).—In the study conducted it was found that the total amount of pollen collected in the traps of a normal colony of bees was not the total amount gathered by the bees, as sufficient pollen was carried through the traps into the hive to maintain brood rearing on a reduced scale. The amount of pollen used by the average normal colony in the apiary in which the records were taken was at least equal to and conceivably greater than the amount recorded for a normal colony. The amount of pollen recorded in 1940 was 122.24 lb. and in 1941, 111.67 lb. per normal colony. Since pollens from different sources vary in chemical composition, the relative food value of a given pollen would have to be considered, along with the amount available, in determining the potential worth of a known pollen plant to a colony.

Various kinds of soybean flour as pollen substitutes, M. H. HAYDAK and M. C. TANQUARY. (Minn. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 317-318).—The results of experimentally feeding bees four brands of solvent-extracted soybean flour mixed with skim milk powder in proportions of 4:1 are reported. It was found that with the decrease of the fat content and of the protein efficiency of the food the mortality of experimental bees increased while their brood rearing capacity decreased. The restoration of the fat content to 5.5 percent by an addition of the crude oil extract to the most promising brand brought about a decrease in mortality and an improvement in the brood rearing capacity of the bees. An addition of 10 percent of dried egg yolk to the dry pollen substitute increased the food value of the latter still further. An addition of raw egg yolk improved the food value of the diet, but a diseased condition which appeared in some larvae would speak against its use as a supplement to pollen substitutes.

Population increase of citrus red mite associated with the use of sprays containing inert granular residues, J. K. HOLLOWAY, C. F. HENDERSON, and H. V. MCBURNIE. (U. S. D. A. coop. Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 3, pp. 348-350).—Sprays containing copper, zinc, manganese, lime, and soda ash were tested to determine the influence of the inert deposits on citrus red mite populations. These were found to increase following the use of a fungicidal spray containing zinc sulfate, copper sulfate, and hydrated lime and after the use of a deficiency spray containing zinc sulfate and soda ash. A predatory mite, *Seiulus* sp., was the only natural enemy in sufficient numbers to be recorded.

Additions to the spider fauna of Puerto Rico, E. B. BRYANT (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 26 (1942), No. 1, pp. 19, figs. 21).

ANIMAL PRODUCTION

[Livestock investigations by the Arkansas Station] (*Arkansas Sta. Bul.* 417 (1942), pp. 20-21, 21-25).—Results are briefly reported by M. C. Kik, E. L. Nielsen, R. M. Smith, N. W. Hilston, and S. R. Johnson on studies of the nutritive value of four grasses and three legumes as ascertained by chemical analyses and feeding experiments with laboratory animals; comparisons of rough rice and corn for egg production; the use of corn silage, sorgo silage, sorgo fodder, and Sudan grass hay for feeding beef calves; and skim milk in swine rations.

[Investigations in livestock production by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 6-7, 10-12, 17-18, 20-23, 24-25, 28, 43-44, 71, 71-74, 74-75, figs. 2).—Progress is briefly presented by A. G. Hogan, L. R. Richardson, J. G. Lee, E. L. Powell, W. H. Bond, J. C. Wooley, C. Kincaid, E. A. Trowbridge, H. D. Elijah, J. E. Comfort, M. W. Hazen, E. M. Brown, J. D. Baldrige, L. A. Weaver, A. J. Dyer, A. G. Hogan, V. F. McRoberts, S. Brody, J. Campbell, H. L. Kempster, and E. M. Funk on vitamin requirements of the pigeon; nutritional requirements of poultry; anemia in chicks; the relation of environmental conditions to egg production and mortality; growth in draft colts; methods of management and production of beef cattle; systems of grazing bluegrass pastures with beef cattle; grains and protein supplements for pigs at weaning; beef produced with minimum grain and maximum roughage; barley for fattening cattle; effect of manganese in rations for brood sows; gains of runt pigs on special rations; nicotinic acid for swine; a comparison of open pollinated and hybrid corn for brood sows; relation between body weight, amount of wool or feathers, and temperature; the influence of environment on winter egg production; the normal growth of chickens under normal conditions; relation of growth in chickens and date of hatching; the gains of chickens of different breeds; the influence of incidence of paralysis on the early growth rate of Rhode Island Reds; the relation of fowl weight at 8 weeks to length of life; comparison of soybean meal and corn gluten meal as protein supplements for turkeys; effects of feeding dehydrated green feeds on hatchability of hens' eggs; seasonal variation in fertility in poultry; influence of washing eggs on hatchability; keeping quality in cold storage of eggs as influenced by prestorage treatment; and the relation of time of hatching to egg production.

[Livestock investigations by the Nebraska Station] (*Nebraska Sta. Rpt.* [1941], pp. 50-55, 61-65, 82-84, 87-88).—The results of comparisons of feeds for cattle, sheep, and swine are briefly presented by L. E. Hanson, W. J. Loeffel, R. R. Thalman, M. A. Alexander, I. L. Hathaway, F. D. Keim, W. E. Ham, F. E. Mussehl, M. L. Baker, and E. M. Brouse on artificially dried Sudan grass meal in comparison with alfalfa meal and protein supplements for growing and fattening pigs on Sudan grass pasture; soybean meal v. cottonseed meal for fattening cattle; old-process v. solvent-process linseed meal as supplements to corn and silage for fattening heifer calves; cracked Early Kalo and cracked corn for fattening cattle; additions of fish meal and alfalfa hay to Early Kalo, silage, and cottonseed cake rations for heifer calves; Early Kalo, soybean pellets, fish liver oil, limited quantities of alfalfa hay and other feeds for lambs; the vitamin content of eight Nebraska grasses; the utilization of feeds by growing chicks; protein utilization from various sources by poult; grain sorghums and corn milling byproducts for poultry; supplemental value of various grain products for chicks; corn products and silage in poultry rations; S-4 lamp radiation for hens; rations for beef cattle, including grain sorghum, silage, stover, prairie hay, soybean meal, dried beet pulp, and alfalfa hay, together with studies of effect of alfalfa pasture; sorghum grains for pigs; and soybean meal for wintering and fattening beef calves.

[Livestock investigations by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1941, pp. 73-76, 82-85, 90-91, 94, 99-101, 117, 130, 133-134, 138, 152, 154-156, 172).—The results are presented and brief progress reported by R. M. Sherwood, J. H. Couch, G. R. Fuller, G. S. Fraps, L. E. James, C. W. Carter, R. L. Baker, W. E. Paulson, G. P. McCarthy, J. N. Thompson, J. M. Jones, W. H. Dameron, B. L. Warwick, J. H. Jones, R. E. Dickson, P. T. Marion, F. E. Keating, J. J. Bayles, L. E. Brooks, R. A. Hall, E. M. Neal, L. H. Tash, Black, J. C. Miller, S. P. Davis, C. M. Lyman, F. Hale, P. B. Pearson, H. Schmidt, R. H.

Wyche, P. B. Dunkle, and V. L. Cory, on studies of protein requirements of chicks; varying amounts of vitamin D with high levels of manganese in the poultry ration; the carotene-destroying power of animal protein feeds; the maximum crude fiber content of chick rations; rations for finishing poults; the calcium and phosphorus requirements of poults; the protein needs of poults; relation of age to fineness of wool and mohair; vitamin A requirements of beef cattle and sheep; mineral and carotene feeding as it affects beef production; ground hegari fodder v. ground red top fodder in rations for fattening steers; alfalfa v. ground quadron stover and ground and unground quadron heads for fattening lambs; linseed meal v. cottonseed meal for fattening beef cattle and lambs; blackstrap molasses in beef cattle fattening rations; fattening Angora goats v. lamb wethers in dry lot; size of sample and determination of grades and shrinkage of Texas wools; quantitative requirements of vitamin A for pigs; concrete wallows for fattening hogs; Sudan grass and oats pasture for fattening pigs; the role of the components of the vitamin B complex in the nutrition of herbivorous animals; hegari stored in trench silos as a feed for fattening beef cattle; comparisons of linseed meal and cottonseed meal for beef cattle and lambs; blackstrap molasses as a substitute for hegari in beef cattle rations; comparisons of hegari and corn for laying hens; growing turkeys under semi-confined conditions; rough rice and no mash v. mash feeding of laying hens; vitamin A requirements for fattening beef cattle; relation of various protein supplements to utilization of carotene by beef animals; cottonseed meal v. peanut meal as protein supplements for fattening steers; hegari, red top, alfalfa, sorghums, and cottonseed meal for fattening beef cattle; maintenance of sheep and cattle on bitterweed ranges; and the nutritive value and control of bitterweed.

Animal husbandry in India, A. OLVER (*Nature [London]*, 149 (1942), No. 3783, pp. 489-491).—A brief summary is given of livestock conditions in India with special reference to cattle production and the sacred nature of cows.

Availability to rats of phosphorus in red clover hays of widely varying phosphorus content, D. E. WILLIAMS, F. L. MACLEOD, and E. MORRELL. (Tenn. Expt. Sta. et al.). (*Jour. Nutr.*, 23 (1942), No. 5, pp. 501-511).—Analysis of the high and low phosphorus red clover hays used in preceding studies (E. S. R., 84, p. 657) indicated that the higher iron and aluminum contents of the low phosphorus samples are sufficient to be a possible disturbing factor in the utilization of phosphorus by the formation of insoluble phosphates. It seems evident that they may interfere with growth and bone development in the rat. Phosphorus supplements with ash from the red clover low phosphorus samples were less available than with ash from high phosphorus samples. It thus seems clear that other minerals may modify the utilization of phosphorus by the rat from the high and low phosphorus hays.

Sweetpotato plant increasingly used as livestock feed, H. W. BENNETT (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 8, pp. 1, 7, 8).—Studies are noted which have shown that sweetpotatoes in many forms may be profitably fed to different types of livestock.

Commercial feeding stuffs, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul.* 487 (1942), pp. 43).—The usual report (E. S. R., 87, p. 834) of 1,598 samples of feeds of 660 brands drawn from dealers' stocks during December 1941 is presented. The 50 samples of feeds failing to comply with their specifications are also indicated.

Velvetbeans, cottonseed meal, and peanut meal as protein feeds for fattening steers in the Coastal Plain area, E. W. MCCOMAS, J. R. DOUGLAS, and B. L. SOUTHWELL. (Coop. Ga. Coastal Plain Expt. Sta.). (*U. S. Dept. Agr.*,

Tech. Bul. 831 (1942), pp. 12, figs. 6).—In four experiments of 126–140 days' duration, lots of steers fattened on rations of ear corn in the husk and peanut straw with velvetbeans as the protein supplement made average daily gains of 2.11 lb. and required less corn and peanut straw per unit of gain than other similar groups with cottonseed meal or peanut meal in place of the velvetbeans. This supplement produced steers that regularly commanded the best selling prices. Cottonseed meal produced more rapid gains than peanut meal, but the latter supplement produced steers of better quality. Each test was conducted with lots of about 12 steers with the supplements balanced to furnish equal amounts of protein.

Cottonseed cake equal to corn in fattening ration, and may be used in large amounts, A. E. CULLISON (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 8, p. 7).—Continuing the studies of large amounts of cottonseed cake for fattening calves (*E. S. R.*, 83, p. 805), the results of two tests with four lots of heifers and steers with approximately 8, 6, 4, and 2 lb. per head daily as supplements to corn produced average daily gains of nearly 2 lb. in 170- and 142-day tests. The small differences between the lots were not considered significant.

Dried citrus pulp in beef cattle fattening rations, J. M. JONES, R. A. HALL, E. M. NEAL, and J. H. JONES (*Texas Sta. Bul. 613 (1942), pp. 20, figs. 4*).—In three trials over about 150 days with 3 lots of 8–10 Hereford steers each, dried citrus pulp consisting almost entirely of grapefruit peel, rag, and seed replaced about 25 percent of the ear corn chop with husks in a ration including cottonseed meal and hegari silage. Practically equal gains were produced with slightly higher finish on the citrus pulp than with corn. Replacing about half of the ear corn with citrus pulp was less palatable, decreased feed consumption, gains, and finish, and had a slight laxative effect. When gains were adjusted to agree with the therms per 100 lb. practically the same results were obtained for ear corn chop with husks and for the citrus pulp. No effect on the color of the fat in the carcass was noted.

"Stringy" wool and copper deficiency in Western Australia, H. W. BENNETTS (*Jour. Dept. Agr. West. Austral.*, 2. ser., 19 (1942), No. 1, pp. 7–13, figs. 5).—Evidence is presented that stringy wool is indicative of copper deficiency. The condition shown in three fleeces with a copper-deficient ration was eliminated in three others by drenching the ewes three times weekly so that the copper intake was equivalent to 15 mg. daily.

Reindeer compared with domestic animals in relation to fattening, sex, and increase, S. HADWEN (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 308–311, figs. 2).

Pig feeding trials, 1938 (*[Irish Free State] Dept. Agr. Jour.*, 37 (1940), No. 1, pp. 71–74).—A summary of pig feeding experiments at 30 centers in which bulky rations of 40 parts corn meal, 20 oats, 30 pollard, and 10 parts bran were compared with a concentrated ration of 70 parts corn meal and 30 parts pollard for feeding pigs from about 12 weeks of age to bacon weight showed practically no differences in the rate of gain. Both rations proved satisfactory and showed that a wide range of home-grown cereals and their byproducts was efficient and suitable for fattening pigs and producing a better type of carcass for conversion into bacon than a ration mainly of corn. There were combined results with 168 pigs on each ration and gradings of 120 carcasses from pigs on the bulky ration and 117 carcasses on the concentrated ration.

Cottonseed meal in large quantities for pigs, P. G. BEDENBAUGH (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 8, p. 5).—In a test with 7 lots of 10 pigs each self-fed yellow or white corn with cottonseed meal, treated in one experiment with 3.4 percent ferrous sulfate, there were produced by the latter treat-

ment average daily gains of 1.48 lb. The group of pigs receiving 85 parts corn with equal parts of cottonseed meal and tankage made average daily gains of over 2 lb. per head. Because of illness or death individual pigs had to be removed from all lots except the control.

Fish meal for growing and fattening pigs, W. L. ROBISON (*Ohio Sta. Bmo. Bul.* 217 (1942), pp. 117-123).—In several experiments with approximately 40 50-lb. pigs fed in dry lot and on pasture during several successive years it was found that the gains produced with corn and fish meal were made approximately as rapidly as with corn, tankage, linseed meal, alfalfa, and minerals. When fish meal or liver meal was added to corn and trio protein mixture average gains were increased. In a comparison of menhaden and white fish meal as supplements to corn for dry lot feeding the menhaden fish meal proved superior both in gains produced and feed consumed. A summary is presented of fish meal experiments elsewhere.

Deficiency symptoms in growing pigs fed a peanut ration, W. G. KIBK and R. M. CROWN (*Florida Sta. Bul.* 372 (1942), pp. 52, figs. 8).—In a preliminary trial of 140 days' duration four lots of four pigs approximating 60 lb. each were fed on peanuts, with and without supplements of calcium carbonate and cod-liver oil available in one half of the lots. The utilization of peanuts for gains and the poor growth resulting indicated that they were not satisfactory, but the addition of 2 gm. of sodium chloride per head daily to half of the pigs restored appetites and thrifty appearance quickly. Satisfactory gains of nearly 1 lb. per head per day were made during the final 48-day period. The breaking strength and specific gravity of the femurs and humeri were slightly decreased by supplementing the ration with calcium carbonate, but the combination of calcium carbonate and cod-liver oil proved most efficient. The breaking strength of the bone was improved by the inclusion of salt in the ration. The calcium and phosphorus composition of the fat-free bones were not appreciably affected by the different rations fed although total ash was increased by the mineral supplements. The results were compared with those of check pigs on pasture. Further experiments with groups of two pigs individually fed similar rations showed that the 2 gm. of salt daily with or without cod-liver oil seemed necessary to provide stimulus for growth needed during the first 14 weeks of the feeding period. Gains of practically 1 lb. per head daily were produced with supplements of salt and calcium carbonate to the peanut ration. Chemical composition and breaking strength of the bones indicated that the rations influenced the total ash and thereby the total calcium, phosphorus, and carbon dioxide in the dried fat-free bone, but did not affect the amount and ratio of calcium and phosphorus found.

Studies on the vitamin B complex in the nutrition of the dog, A. E. SCHAEFER, J. M. MCKIBBIN, and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 23 (1942), No. 5, pp. 491-500, figs. 2).—Continuing the studies of the vitamin B requirements of the dog (*E. S. R.*, 86, p. 229), no rapidly fatal deficiency appeared on purified rations supplemented with the synthetic vitamins thiamin, riboflavin, nicotinic acid, pyridoxin, pantothenic acid, and choline. When any one was left out of the diet symptoms of faulty growth and weight decline appeared in puppies in 3-6 weeks and in older dogs in 1-3 mo. Purification of washed casein by alcohol extraction was accompanied by loss of weight and some hair graying not due to pantothenic acid deficiency. Growth on the purified ration was increased by supplements of a liver extract which seemed to contain a factor synthesized in the intestine of the dog with the aid of nicotinic acid. The condition was not rectified by supplements of inositol, p-amino benzoic acid, and glutamine. The study led to indications of possible qualitative differences in the requirements of the dog and other animals.

A calibration of the development of the chick under-improved conditions of incubation and the relationship of developmental rate to age of hen and hatchability record, J. K. NEEL (*Poultry Sci.*, 21 (1942), No. 4, pp. 294-300).—The mean stage and range of development of eggs removed at 6-hr. intervals from 24 to 72 hr. showed there was an acceleration of growth as incubation continued with uniformity of rate attained at about 72 hr. During the period 24-48 hr. development was slightly more than half that occurring during the period 48-72 hr. The calibration was made on groups of about 25-30 eggs from Rhode Island Red hens which were laid only between 10 a. m. and 4 p. m. to exclude excessive brooding of eggs held in the oviduct overnight. Incubation began at 6 p. m. on the date of laying, and the egg temperature of 92° F. was attained before the timing period was started. High egg development rate was correlated with high percentage hatchability. Both rate of development and percentage hatchability decreased with advancing age of the hens from 2 to 4 yr.

Backyard hatching and brooding of chicks, E. HOFFMAN (*New Jersey Stas. Hints to Poultrymen*, 29 (1942), No. 5, pp. 4).—General directions for hatching, housing, and caring for the setting hen and her chicks.

Blood values of hens fed a yeast-fermented mash supplemented adequate diet, C. J. HAMRE and J. T. MCHENRY. (Hawaii Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 333-339, fig. 1).—The hematological elements and blood values of hens receiving yeast-fermented mash as a supplement to an adequate diet over 7 and 19 mo. did not differ significantly from values of birds receiving control diets. Notwithstanding the discordance of values reported in the literature, similar results were found with 39 hens fed the control and yeast-fermented rations. Hemoglobin and differential blood counts were tabulated. These counts may be considered normal for the chick.

Broodiness and viability, T. C. BYERLY and C. W. KNOX. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 370-373, fig. 1).—Tabulation of the broodiness and mortality in July to October for 5 yr. among 1,369 broody and 3,199 non-broody hens of the heavy breeds in the Beltsville Research Center flock showed that there was 9.1 percent mortality among the broody and 18.8 percent among those which were nonbroody. It was suggested that the lack of the broody mechanism with its consequent flooding of the laying hen with ♀ hormone may increase the mortality by increasing the incidence of neoplasms.

Methods and rations for fattening poultry, IV-VI, H. S. GUTTERIDGE and J. B. O'NEIL (*Sci. Agr.*, 21 (1941), Nos. 9, pp. 517-521; 10, pp. 607-612; 11, pp. 711-716).—In continuation of the series previously noted (E. S. R., 85, p. 654), three papers are presented.

IV. The relative value of certain cereal grains, of bone meal, and of premixing of feeds (pp. 517-521).—In 2-week periods of crate fattening roasters, Barred Plymouth Rock cockerels made similar gains on yellow corn and ground buckwheat. Both were superior to ground barley and ground oats when fed with 5 percent bonemeal. There was no beneficial effect from additions of the bonemeal either in quality or amount of fat. The grains were fed with fresh skim milk with premixing of the rations for half of the birds of each lot.

V. The comparative effect of hulled oats and yellow corn, of skim milk and water, and of varying temperatures (pp. 607-612).—Fattening of 144 cockerels at temperatures ranging from 23° to 70° F. showed that corn meal-fattened birds produced only 83.5 percent of the gains made by cockerels receiving coarsely ground hulled oats. However, corn meal proved equivalent to the oats for the production of fat and grading quality. The oat-fed birds, however, produced

whiter flesh. Skim milk was superior to water for mixing mash. Differences in the temperature did not seem to be an important factor.

VI. The comparative economy of range rearing, crate fattening, and caponizing for production of roasters (pp. 711-716).—A summary of the costs of producing poultry by different methods showed that crate feeding was most efficient for the production of the best finished birds. The least economical procedure was direct killing of cockerels off range. Caponizing at 5 ct. per bird gave results surpassed in economy only by crate fattening.

The effect of fibre and "bulk" in the dietary on the progress of chickens and on the prevention of feather picking and cannibalism, E. J. SHEEHY and E. M. BURKE ([*Irish Free State*] *Dept. Agr. Jour.*, 37 (1940), No. 1, pp. 42-70, pls. 6).—The tendency of chickens to look for extraneous material and to pick at the feathers of other chickens became less as the percentage of bran in the ration increased and consequently the fiber content was greater. Soaking before feeding wheat bran or oats did not alter the effect on the behavior of the chicks. Feather picking was largely checked by the addition of fiber or oats to a concentrated ration, but there was no further benefit above 6 percent. For rapid fattening the best results were obtained with about 5 percent fiber. Wheat bran containing the same fiber content proved superior to oats in the prevention of feather picking. Feather picking was inhibited by lawn clippings, mangels, and molasses beet pulp. The character of the droppings seemed to be modified by the fiber in the rations. Chickens may influence the bulk in their diet by litter consumption. In this study there were conducted 11 experiments with 2-4 groups of about 40-50 White Wyandottes in each, fed for 10 weeks in confinement on rations containing 2.7-8.9 percent fiber.

Observations on the stability of vitamin D, J. C. FRITZ, W. F. ARCHER, and D. K. BARKER (*Poultry Sci.*, 21 (1942), No. 4, pp. 361-369).—Hammond et al. (E. S. R., 87, p. 282) found heat to interfere with the calcification induced by vitamin D, and further study of the stability of vitamin D showed the activity to be lost when many common ingredients were mixed with poultry feeds and stored. Among the destructive feeds were oystershell, dried milk products, crystalline sugars, washed sand, and other ingredients of poultry feeds. It seemed that the destruction of vitamin D resulted from air oxidation and that protection was offered by cereals, absorbent carriers, or gases. In the studies several sources of vitamin D were employed, and the destruction by milk solids was surprising. In connection with the investigation storage of vitamin D up to 11 mo. was ascertained in different mixtures. Preservation was only possible for more than 6 mo. in feeds containing soybeans or soybean meal, which presumably contain antioxidants.

Experiments on the storage of vitamin A by growing turkeys, T. H. JUKES. (Univ. Calif.). (*Poultry Sci.*, 21 (1942), No. 4, pp. 357-360).—In three experiments turkeys on a vitamin A-deficient diet were shown to store vitamin A fed as a supplement in the liver. The liver concentration ascertained 3 days after feeding one capsule containing 0.792 gm. of shark-liver oil was sufficiently greater than that found in the liver 8 days after feeding to indicate that about 30 percent of the dose was stored. Similar results were obtained in another experiment in which one and three shark-liver oil capsules were administered to turkeys with the deficient diet. After 30 days the livers contained sufficient vitamin A to show that the single massive doses protected the birds from the symptoms of A deficiency. In another experiment turkeys were found to die from vitamin A deficiency in an average of 37.6 days when no fish oil was given, but the survival time was increased to an average of 118.9 days when one capsule of the shark-liver oil was supplied.

DAIRY FARMING—DAIRYING

[Abstracts of papers presented at the thirty-seventh annual meeting of the American Dairy Science Association] (*Jour. Dairy Sci.*, 25 (1942), No. 8, pp. 667-731).—Following are listed the titles and authors of papers pertaining either to dairy manufacturing or dairy production, presented at the annual meeting of the association (E. S. R., 85, p. 518) held at East Lansing, Mich., June 22-25, 1942: Present-Day Techniques of Artificial Insemination, by G. W. Trimberger (pp. 671-673) (Univ. Nebr.); Storing, Packaging, and Shipping Semen, by G. W. Salisbury (p. 673) (Cornell Univ.); Simple v. Complex Rations for Dairy Cattle, by C. F. Monroe and W. E. Krauss (pp. 673-674) (Ohio Expt. Sta.); Improving Dairy-Cattle Pastures, by W. B. Nevens (pp. 677-678) (Univ. Ill.); The Ability of Yearling Heifers to Withstand Cold Temperatures, by J. R. Dice (pp. 678-679) (N. Dak. Agr. Col.); Resting Maintenance Cost in Growing Dairy Cattle, by S. Brody, H. H. Kibler, and A. C. Ragsdale (p. 679) (Mo. Sta.); The Occurrence and Importance of Still-Unidentified Nutrients in Milk and Milk Products, by A. M. Hartman and C. A. Cary (pp. 679-680), and Hydroxyamino Acids of Milk Proteins, by B. H. Nicolet, L. A. Shinn, and L. J. Saidel (p. 680) (both U. S. D. A.); Utilization of Urea by Calves Less Than Four Months of Age, by J. K. Loosli, C. M. McCay, and L. A. Maynard (pp. 680-681) (Cornell Univ.); The Feeding of Korean Lespedeza Seed as a Protein Supplement for Milk Production, by H. A. Herman and A. C. Ragsdale (pp. 681-682), and The Biological Values of Lespedeza, Alfalfa, Corn, and Milk Proteins for Growing Dairy Heifers, by E. W. Swanson, H. A. Herman, and A. C. Ragsdale (pp. 682-683) (both Mo. Sta.); A Comparison of Acetic Acid, Fed as Triacetin, With Glucose as a Nutrient in Feeds, by T. B. McManus and C. B. Bender (pp. 683-684) (N. J. Stas.); Ruminal Gases in Normal and Bloat Animals, by T. M. Olson (pp. 684-685) (S. Dak. Sta.); Further Nutritional Studies on Calf Scours, by N. S. Lundquist and P. H. Phillips (p. 685) (Univ. Wis.); Factors Affecting the Vitamin A and D Potency of Alfalfa Hay, by G. C. Wallis (pp. 685-687) (S. Dak. Sta.); The Vitamin A and Carotene Content of the Blood Plasma of Calves From Birth to Four Months of Age, by L. A. Moore (p. 687) (Md. Sta.); Vitamin C in Dairy Cattle Nutrition, by G. C. Wallis (pp. 687-688) (S. Dak. Sta.); Carotene (Provitamin A) Requirements of Dairy Cattle for Conception, by A. H. Kuhlman and W. D. Gallup (pp. 688-689) (Okla. A. and M. Col.); The Relation of Nutrition to Breeding Performance in Dairy Bulls, by I. R. Jones, J. R. Haag, and R. W. Dougherty (pp. 689-690) (Oreg. Sta.); Some Preliminary Results of Feeding Chloretone to Bulls, by E. C. Scheidenhelm, A. L. Bortree, C. F. Huffman, and C. F. Clark (pp. 690-691) (Mich. State Col.); Effect of Amphyl on Bull Sperm, by H. O. Dunn, C. E. Shuart, and O. F. Garrett (pp. 691-692) (N. J. Stas.); The Relation of Morphology to Fertility in Bull Semen, by G. W. Trimberger and H. P. Davis (pp. 692-693) (Nebr. Sta.); Studies of Respiration Rate of Dairy Bull Spermatozoa, by R. E. Fly (pp. 693-694), and The Breeding Efficiency of Dairy Bulls Used Both Artificially and Naturally, by E. R. Berousek (pp. 694-695) (both Mo. Sta.); A Comparison of Artificial v. Natural Service in Heifers When Bred to the Same Sire, by C. E. Shuart, O. L. Lepard, and J. W. Bartlett (pp. 695-696) (N. J. Stas.); The Availability of Carotene in Alfalfa Hay as Compared With Carotene in Oil, by J. H. Hilton, J. W. Wilbur, R. J. Westfall, and S. M. Hauge (p. 696) (Purdue Univ.); The Cause of the Initiation of Lactation at Parturition, by J. Meites and C. W. Turner (pp. 696-697) (Mo. Sta.); Prehypophyseal Hormone (Mammogen) Control of Mammary Development, by E. T. Gomez (pp. 698-699) (U. S. D. A.); The

Effect of Adrenalectomy on the Lactogenic Hormone and Initiation on Lactation, by J. L. Trentin, J. Meites, and C. W. Turner (pp. 699-700), The Influence of Thyroxine Upon the Stimulation of Mammary Lobule-Alveolar Growth, by J. P. Mixner (p. 700), The Effect of Thyroxine on Rate of Growth and Efficiency of Weight Increment, by M. Koger and C. W. Turner (pp. 700-701), Growth and Energy Metabolism of Thyroidectomized Cattle, by S. Brody (p. 701), and The Effect of Thyrolactin on Milk Production, Metabolism, and Growth (pp. 701-702) and The Chemical Formation of Highly Active Thyroprotein (pp. 702-703), both by E. P. Reincke (all Mo. Sta.); Methods for Prolactin Assay Including Data on the Anterior Pituitary Prolactin Content of Dairy and Beef Cattle and Female Rabbits in Several Physiological Conditions, by S. R. Hall and B. H. Nicolet (pp. 703-704), An Intravenously Active Ovulating Factor in the Juice of Corn and Oat Plants, by J. T. Bradbury and R. E. Hodgson (pp. 704-705), and Further Evidence of the Existence and Specificity of an Orally Active Sex Maturity Factor(s) in Plant Juice Preparations, by E. T. Gomez (pp. 705-706) (all U. S. D. A.); Some Possibilities for the Use of Diethylstilbestrol in Dairy Cattle, by A. A. Lewis (pp. 706-707) (Mo. Sta.); The Influence of Ascorbic Acid on the Gonadotropic Hormone Content of the Male Rat Pituitary Gland, by R. P. Reece and E. J. Weatherby (pp. 707-708) (N. J. Stas.); Vitamin D, the Parathyroid Glands, and Calcium Metabolism, by I. L. Campbell (p. 708) (Mo. Sta.); Oxygen Uptake and CO₂ Elimination of the Bovine Mammary Gland, by W. E. Petersen and J. C. Shaw (pp. 708-709) (Univ. Minn.); The Enzymatic Hydrolysis of Diacetin by Bovine Mammary Gland Tissue, by P. L. Kelly (p. 709) (Ark. Sta.); The Effect of the Continuous Injection of Pitocin Upon Milk and Milk Fat Production, by C. B. Knodt and W. E. Petersen (pp. 709-710) (Univ. Minn.); The Incidence and Control of Milk Fever, by C. F. Monroe, W. E. Krauss, T. S. Sutton, and W. D. Pouden (pp. 710-711), and The Blood Picture in Normal and Milk Fever Cows, by W. E. Krauss, C. F. Monroe, R. G. Washburn, J. W. Hibbs, T. S. Sutton, and N. Van Denmark (pp. 711-712) (both Ohio Sta.); Nature of the Material in Mastitic Milk Responsible for the Whiteside Reaction, by H. O. Dunn, J. M. Murphy, and O. F. Garrett (pp. 712-713) (N. J. Stas.); The Value of Tyrothricin (Gramicidin) in a Herd Mastitis Control Program, by C. S. Bryan, R. E. Horwood, and C. F. Clark (p. 713) (Mich. Sta.); Experiences With Lactovaccine in the Control of Mastitis, by C. F. Clark, C. S. Bryan, and R. E. Horwood (pp. 713-714) and Mastitis and Herd Practices in the College Dairy Herd, by R. E. Horwood, C. F. Clark, and C. S. Bryan (pp. 714-715) (both Mich. State Col.); The Effect of Acidity and Temperature on the Growth of *Oospora luctis* Cultures, by E. R. Garrison (pp. 716-717), and Various Treatments Which Affect the Growth of Mold Mycelia in Cream and Resultant Butter, by J. E. Edmondson and W. H. E. Reid (pp. 717-718) (both Mo. Sta.); The Development of a Positive Phosphatase Test on Refrigerated Pasteurized Cream, by F. W. Barber and W. C. Frazier (p. 718) (Univ. Wis.); The Keeping Quality of Cream Pasteurized at 165° F. for 30 Minutes, Variously Treated, and Stored at 0° F., by E. S. Guthrie (pp. 718-719), and The Keeping Quality of Unsalted Butter Made From Sweet Cream Pasteurized at 165° F. for Thirty Minutes and Stored at 0° F. and 32° F., by C. N. Stark, E. S. Guthrie, and J. J. R. Campbell (p. 719) (both Cornell Univ.); Some Observations Concerning the Ascorbic Acid Content of Evaporated Milk, by D. V. Josephson and F. J. Dean (pp. 719-720) (Pa. Sta.); Control and Verification of Vitamin D in Milk, by M. J. Dorcas (pp. 720-721); A Voltammetric Method for Measuring the Concentration of Dissolved Oxygen in Dairy Products, by G. H. Hartman and O. F. Garrett (p. 721) (N. J. Stas.); Studies of the

Mechanisms of Oxidized Flavor, by W. C. Brown and F. C. Olson (pp. 721-722) (W. Va. Sta.); **Relation of Dissolved Oxygen to Certain Oxidation Reactions in Milk**, by G. H. Hartman and O. F. Garrett (pp. 722-723) (N. J. Stas.); **The Role of the Oxidase Producing Bacteria in the Development of Oxidized Flavor in Milk**, by J. F. Cone and C. J. Babcock (p. 723) (U. S. D. A.); **Bacteriological Studies on Creamery Water Supplies**, by R. T. Corley and B. W. Hammer (pp. 723-724) (Iowa Sta.); **Sensory Adaptation as a Factor in the Judging of Dairy Products for Flavor**, by S. T. Coulter (pp. 724-725) (Univ. Minn.); **A Quick, Colorimetric Method for Estimating the Quality of Butter**, by E. S. Guthrie and G. Knaysi (p. 725) (Cornell Univ.); **Forewarming Temperature of Plain Condensed Skimmilk and Properties of the Resulting Ice Cream**, by J. B. Clinch and J. H. Erb (pp. 725-726) (Ohio State Univ.); **Relation of Different Mix Compositions and Methods of Processing to the Texture, Structure, and Stability of Ice Cream**, by C. W. Decker and W. H. E. Reid (pp. 726-727) (Mo. Sta.); **The Gases Evolved by Cheddar and Limburger Cheese**, by F. L. Dorn and A. C. Dahlberg (p. 727) (N. Y. State Sta.); **The Preparation of Crystalline Rennin**, by C. L. Hankinson (pp. 727-728); **The Use of Rennet Paste in Romano-Type Cheese**, by C. A. Phillips, G. A. Richardson, and N. P. Tarrasuk (pp. 728-729) (Univ. Calif.); **Studies Relating to the Canning of Pasteurized Milk Cheese**, by A. C. Dahlberg and J. C. Marquardt (p. 729) (N. Y. State Sta.); **Comparative Studies on Cheddar Cheese Prepared With Starter and With Certain Pure Cultures**, by D. D. Deane and T. G. Anderson (pp. 729-730) (Pa. State Col.); and **General Action in Cheese of an Enzyme Preparation From Chicken Stomach**, by F. J. Babel, G. F. Stewart, and B. W. Hammer (pp. 730-731) (Iowa Sta.).

[**Investigations in dairy production by the Missouri Station**] (*Missouri Sta. Bul.* 444 (1942), pp. 34-36, 37-38, 39, 42-43, 44, 45-46, 47).—Results are briefly reported by A. C. Ragsdale, H. A. Herman, N. P. Ralston, V. E. Peterson, C. W. Turner, E. P. Reineke, C. W. McIntyre, S. Brody, L. E. Washburn, E. R. Garrison, W. H. E. Reid, and W. S. Arbuckle of investigations on the influence of rations and management practices on the rate of growth and milk production of dairy heifers; factors influencing the solids-not-fat content of milk; precursors of milk constituents in the blood; the influence of roughage feeding on milk production; basal energy metabolism of lactating dairy cattle, goats, and rats; growth and metabolism of total and partial thyroidectomized dairy calves; growth, milk production, energy metabolism, and energetic efficiency of milk production in goats; the influence of fasting and refeeding on milk production, heat production, and respiratory quotient in dairy cattle and goats; fluorescent bacteria in dairy products; and the keeping quality of high serum solids ice cream.

[**Production of dairy cattle and dairy products by the Texas Station and cooperating agencies**] (*Texas Sta. Rpt.* 1941, pp. 26-29).—Brief results are presented by O. C. Copeland, G. S. Fraps, F. E. Hanson, C. N. Shepardson, A. L. Darnell, G. R. Fuller and W. S. Arbuckle on requirements of vitamin A for conception in dairy cattle; relation of temperature exposures to quality of southern short-cure Cheddar cheese; relation of manufacture and other conditions to quality of butter; dried citrus peel and pulp, dehydrated sweetpotato pulp, ground shelled corn, and high and low protein rations for lactating dairy cows; legume v. non-legume dry roughage for dairy cattle; milk substitute v. skim milk for dairy calves; and variations in the normal composition of milk produced in Texas.

Adequate feeding highly important in dairies of State, J. S. Moore (*Miss. Farm Res.* [Mississippi Sta.], 5 (1942), No. 8, p. 6).—Savings in feed effected by reducing the consumption of dairy cows were more than offset by the reduced value of the milk and products produced.

Comparative palatability of some cereal pastures, A. O. SHAW and F. W. ATKESON. (Kans. State Col.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 503-506).—Six cows having free access to equal areas of Balbo rye, common rye, wheat, and barley grazed an average of 52, 24, 18, and 6 percent of the time on these respective crops. The preference for Balbo rye and the dislike for barley was uniform for all cows.

A comparison of legume hays for milk production, C. C. HAYDEN (*Ohio Sta. Bul.* 631 (1942), pp. [1]+26, figs. 14).—Groups of three 7-11-month-old Holstein-Friesian heifers each were fed continuously on ground shelled corn with alfalfa, clover, and soybean hay, respectively. Four yr. or more results with each of the cows showed clover protein to be fully equal to alfalfa protein for milk production, but the differences were scarcely significant. During the first 10 mo. after calving the clover group consumed the most feed and the alfalfa group the least. Those on the clover hay required the least protein per unit of milk produced. The restricted rations are considered responsible for the excessive consumption of nutrients per unit of milk produced. Supplementing these rations with bonemeal at the rate of 2 oz. per head daily increased production about 600 lb. of milk and 20 lb. of fat per year. No single kind of legume roughage should be fed exclusively over long periods of time. No difficulties in reproduction during the four lactations were apparent, but the livers of the three alfalfa-fed cows and one soybean-fed cow were in bad condition when the animals were ultimately slaughtered. When rations were made more adequate after the completion of four lactations, the milk production was improved.

The nutritive value of alfalfa hay.—I, Cystine as a supplement to an all-alfalfa hay ration for milk production, C. F. HUFFMAN and C. W. DUNCAN. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 507-515).—Employing a method for studying the deficiencies of alfalfa hay as previously reported (E. S. R., 80, p. 94), the addition of 20 gm. of *L*-cystine per day to an alfalfa hay ration for each of four cows did not increase milk production significantly, although tending to check the rapid decline in milk and fat production which was in progress on the alfalfa ration. The addition of 40 gm. of *L*-cystine per day to the ration of one cow produced a decrease in hay consumption and a sharp drop in milk and fat production but an increase in body weight. The replacement of part of the alfalfa hay with isocaloric amounts of corn significantly increased milk and fat production over the initial alfalfa feeding period and the subsequent cystine feeding period, thus indicating that cystine is not the first deficiency of an all-alfalfa hay ration.

A statistical study of the influence of moisture and acidity on the palatability and fermentation losses of ensiled hay crops, T. E. WOODWARD and J. B. SHEPHERD. (U. S. D. A.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 517-523).—Data obtained over a number of years on the palatability and fermentation losses in experimental lots of silage prepared from various grasses and legumes were subjected to statistical analysis. When compared on the basis of moisture content without reference to other treatment, the silages of relatively low moisture content (average 45 percent) were better in odor and palatability than those from comparable groups but of higher moisture content (average 70.6 percent). Losses in dry matter and protein were not significantly influenced by the moisture content, while preservation of carotene was significantly better in the high-moisture lots. Silages treated with molasses (average pH 4.36) were significantly more palatable than comparable lots prepared without molasses (average pH 4.76). There was little difference in the loss of nutrients in the treated and untreated lots. Silages treated with hydrochloric and sulfuric acids (average pH 3.66) were less palatable than un-

treated silages from the same crops (average pH 5.18). High acidity favored the conservation of nutrients in the silo, the difference being highly significant in the case of carotene but of doubtful significance for dry matter and protein. Practical recommendations are drawn from these findings.

Studies on the chemical composition of the blood of dairy cattle.—III, The normal concentration of inorganic phosphorus in the whole blood of dairy cattle and factors affecting it, A. H. VANLANDINGHAM, H. O. HENDERSON, and G. A. BOWLING. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 537-548, figs. 2).—Continuing this series of investigations (E. S. R., 76, p. 681), inorganic phosphorus was determined in over 600 composite samples of whole blood from cows and heifers in normal states of health and nutrition, using a previously described method for preparing the composite samples (E. S. R., 68, p. 809). Under the nutritive conditions employed, age was found to be the most important factor affecting the inorganic phosphorus of the blood. In general, the concentration increased up to 7 or 8 mo. of age and then gradually declined with advancing age. Pregnant heifers showed a lower concentration than unbred heifers of approximately the same age. There was no significant change during the first lactation, but there was a strong tendency for cows to show low values during the late weeks of the second gestation and the first 2 or 3 mo. of the second lactation. A similar trend was also followed near the end of the third gestation and for a month or more at the beginning of the third lactation. Season of the year or the fact that heifers were confined to the barn continuously or permitted to run outside in favorable weather had no apparent effect on inorganic phosphorus of the blood. However, for cows in the first lactation the concentration tended to be lower during the winter and early spring than during the summer and early fall.

Blind halves in a goat's udder, C. W. TURNER and E. R. BEROUSEK. (Mo. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 549-555, figs. 3).—This case history concerns a milk goat which failed to give milk after parturition. Examination revealed that both udder halves were blind, although the gland tissue was capable of secreting milk. It is indicated that the condition is probably due to an inherited or developmental defect rather than to the development of an overgrowth of connective tissue caused from mastitic infection.

Seventy years of selection for conformation in dairy cattle, A. A. LEWIS. (Univ. Mo.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 489-501).—A detailed analysis of the breeding involved in 5,180 cases of Commended and Highly Commended Jersey Island cattle.

Factors affecting the passage of liquids into the rumen of the dairy calf.—II, Elevation of the head as milk is consumed, G. H. WISE, G. W. ANDERSON, and P. G. MILLER. (S. C. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 529-536, figs. 2).—Continuing this series (E. S. R., 82, p. 240), information gained in anatomical studies and feeding experiments is presented. From a study of the relationship of the various organs in the young calf, it is concluded that "from a purely anatomical viewpoint it is difficult to relate the positions of the head and neck of the calf to the functioning of the esophageal groove." Repeated observations were made on the frequency with which milk entered the rumen when calves consumed milk from a rubber nipple and from an open pail, both at the floor level and from an elevated position (pail adjusted to bring the poll on a level with the withers). It was found that, irrespective of the feeder level, milk seldom entered the rumen when consumed from a nipple but frequently entered when consumed from an open pail. Apparently the transmission of stimuli regulating the esophageal groove is unaffected by the positions of the head and neck.

The nutrition of calves: A review, E. S. SAVAGE and C. M. McCAY. (Cornell Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 7, pp. 595-650).—A comprehensive review, with 280 references to the literature.

Carotene in calf nutrition, H. A. KEENER, S. I. BECHDEL, N. B. GUERRANT, and W. T. S. THORP. (Pa. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 7, pp. 571-583, figs. 3).—Continuing this line of investigation (E. S. R., 83, p. 99), data are presented to indicate that the minimum carotene requirement for growth and well-being of dairy calves is dependent upon environmental temperature. Within a temperature range of 50°-70° F., about 12 μ g. of carotene per pound of body weight daily appeared adequate, which essentially confirms earlier findings at the Pennsylvania Station, but during severe winter weather the minimum requirement increased to more than double this amount. The observed decline in blood carotene and blood vitamin A values during cold weather substantiated this increased requirement, and the severity of the gross and microscopic pathology agreed closely with the degree of deficiency observed before the calves were slaughtered. It is suggested that such histopathological changes may exist in calves raised in regions where roughage of poor quality is fed, and that these conditions may affect the productive and reproductive efficiency of the dairy cattle of such regions.

Investigations of dairy manufacturing by the Nebraska Station [*Nebraska Sta. Rpt.* [1941] pp. 55, 57-58).—Brief results are presented by L. K. Crowe, P. A. Downs, and C. H. Sanders on investigations on the characteristics of ice cream and ice cream mixes from several sources; and milk quality as affected by the individual cow.

A method for surface area measurement of milk bottles, W. D. BATEN and P. S. LUCAS. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 8, pp. 663-665, fig. 1).—The approximate area of the outer and inner surface of a milk bottle was calculated by dividing the bottle into small sections, as described, each section representing a frustum of a cone whose surface may be calculated by formulas presented. The combined outside and inside surface area of a quart bottle of the design used in this study was 200.4 sq. in., which was 1.62 times greater than that of a pint bottle and 2.43 times greater than that of a half-pint bottle.

Effect of homogenization on the curd tension, digestibility, and keeping quality of milk, C. J. BABCOCK (*U. S. Dept. Agr., Tech. Bul.* 832 (1942), pp. 24, fig. 1).—A study was made of the effects of various conditions including pressure of homogenization, temperature, and other conditions on the curd tension and keeping quality of milk. The pressure of 2,500 lb. was found to give the maximum reduction in curd tension. Higher temperatures lowered the curd tension except when homogenization followed pasteurization. Homogenization at the pasteurizing temperature caused a slightly higher curd tension than homogenization at temperatures either below or above pasteurization. Two stages of homogenizers gave the same reduction in curd tension as single-stage homogenizers. Mixing homogenized soft-curd milk with unhomogenized milk lowered the theoretical curd tension only slightly for the mixture. Boiled milk and homogenized milk were more readily but not more completely digested than raw milk. It seemed quite evident that homogenized milk formed smaller curds than unhomogenized milk in the presence of artificial gastric juice in digestion in vitro. About 10 times as much copper was required to produce oxidized flavor in homogenized milk as in similar milk before homogenization. However, homogenized milk required only approximately half as long exposure to sunlight as unhomogenized milk to produce a sunlight-induced oxidized flavor. Homogenized and unhomogenized milk were equal in keeping quality when

stored at low temperature. No significant differences between the two milks were noted from the bacteriological standpoint or in rate of development of acid.

Clean and cold milk, R. S. BREED (*New York State Sta. Cir. 93, rev. (1942), pp. 4, figs. 4*).—A revision (E. S. R., 57, p. 668) of directions for producing clean milk and keeping it free from dirt and bacterial contamination.

Influence of a film yeast, *Candida krusei*, on the heat resistance of certain lactic acid bacteria grown in symbiosis with it, H. J. PEPPLER and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Bact.*, 43 (1942), No. 2, pp. 181-191, figs. 3).—A more detailed report of research previously noted (E. S. R., 85, p. 662).

Observations on the rate of growth of *Oospora lactis*, H. B. MORRISON and H. W. HILL. (Ky. Expt. Sta.). (*Jour. Bact.*, 43 (1942), No. 2, p. 271).—When spores of *O. lactis* were streaked on standard agar and incubated at room temperature (70°–75° F.), the average time required for 10 colonies to produce 100 μ , 500 μ , and 1,000 μ of mycelia was 10.71, 14.21, and 15.28 hr., respectively. At 58° comparable lengths were attained in 44.3, 59.0, and 65.7 hr., respectively. However, after the mycelium had reached a length of 600 μ growth was practically as rapid at 58° as at 70°–75°.

Control of mold in farm cream supply (*Arkansas Sta. Bul. 417 (1942), pp. 9-10*).—Studies by T. J. Claydon and L. B. Schweiger showed that the mold counts of experimental butter were generally proportional to the mold content of the cream, which might be modified by a variety of conditions.

The evaluation of flavor defects of butter, cheese, milk, and ice cream as designated by dairy products judges, G. M. TROUT, P. A. DOWNS, M. J. MAACK, E. L. FOUTS, and C. J. BABCOCK (*Jour. Dairy Sci.*, 25 (1942), No. 7, pp. 557-569).—Another detailed report by the committee of the American Dairy Science Association on judging dairy products (E. S. R., 82, p. 675) presents results of the flavor scoring of butter, cheese, milk, and ice cream by 47 trained judges and a panel of 5 selected judges for each product.

Methods for manufacturing acid-precipitated casein from skim milk, revised by E. O. WHITTIER (*U. S. Dept. Agr. Cir. 279, rev. (1942), pp. 30, figs. 6*).—This is a revision of an earlier edition (E. S. R., 70, p. 524). General directions are presented for the manufacture of acid-precipitated casein of high grade. The establishment of a suitable plant for this purpose is described. Fundamental steps in the manufacture and likelihood of defects are pointed out.

The use of ultraviolet rays in the cheese factory and storage room, F. R. SMITH. (Univ. Calif.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 525-528).—Six 15-w. low-pressure mercury-vapor lamps, when placed in a cheese-curing room approximately 15 by 12 by 11 ft. in size, with forced-air circulation, failed to show any control of the undesirable surface-mold formation in the room. Small-scale, carefully controlled experiments confirmed this finding. Direct irradiation of the cheese surface, both before and after paraffining, with a lamp 10 in. from the cheese failed to prevent mold growth on the cheese surface.

A study of the coliform group in ice cream, H. J. FOURNELLE and H. MACY. (Minn. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 6, pp. 475-487, fig. 1).—Examination of 69 samples of factory-packed ice cream showed a range in coliform counts (in terms of most probable numbers) from 0 to 9,180 per cubic centimeter, and in 80 scoop or dipper samples a range from 0 to 101,000. It is indicated on the basis of these findings that factory-packed ice cream should contain less than 10 coliform organisms per cubic centimeter. Predominating species in the factory-packed and scoop samples, respectively, were *Aerobacter cloacae* 29.5 and 88.2 percent, *A. aerogenes* 23.8 and 18.0, *Escherichia freundii* 27.8

and 28.1, *E. coli* 5.3 and 1.1, and *E. coli neapolitana* 3.1 and 5.6 percent. Non-coliform species isolated from these samples constituted 9.7 and 6.8 percent of the total number in the respective samples.

VETERINARY MEDICINE

Keeping livestock healthy: Yearbook of Agriculture 1942 (*U. S. Dept. Agr. Yearbook 1942*, pp. XIII+[1]+1276, figs. 196).—This volume is the seventh in this series (*E. S. R.*, 86, p. 293). Following a foreword by C. R. Wickard, and a summary by G. Hambidge (pp. 1–107), the volume is subdivided into nine parts, as follows:

Part 1. Fundamentals of disease and insect control.—Losses Caused by Animal Diseases and Parasites, by J. R. Mohler, A. E. Wight, W. M. MacKellar, and F. C. Bishopp (pp. 109–116); Causes of Disease, by H. W. Schoening, B. Schwartz, W. T. Huffman, and L. L. Madsen (pp. 117–137); Protective Mechanisms Against Disease, by A. Eichhorn, M. P. Sarles, and N. R. Ellis (pp. 138–154); The Endocrine Glands in Health and Disease, by A. H. Frank (pp. 155–166); The Relation of Genetics to Disease, by H. C. McPhee (pp. 167–174); Artificial Insemination and Disease Control, by A. H. Frank and R. W. Phillips (pp. 175–178); Disinfection and Disinfectants, by F. W. Tilley (pp. 179–187); How Research Aids in Disease Control, by J. R. Mohler (pp. 188–202); Origin and Spread of Important Insect Pests of Animals, by H. H. Stage and J. A. Hyslop (pp. 203–208); Regulatory Activities in Animal-Disease Control, by A. W. Miller, S. O. Fladness, A. E. Wight, D. I. Skidmore, E. C. Joss, and H. E. Moskey (pp. 209–226); and Fighting Disease With Knowledge, by D. S. Burch (pp. 227–235).

Part 2. Important general diseases common to several species.—Tuberculosis and Its Eradication, by A. E. Wight, E. Lash, H. M. O'Rear, and A. B. Crawford (pp. 237–249); Anthrax, by C. D. Stein (pp. 250–262); Foot-and-Mouth Disease, by J. R. Mohler and J. Traum (pp. 263–275) (coop. Univ. Calif.); Parasites and Insects Affecting Livestock, by B. Schwartz and F. C. Bishopp (pp. 276–294); Bacterial Infections and Parasites Common to Man and Animals, by G. W. Stiles and J. T. Lucker (pp. 295–312); The Screwworm and Blowfly Problem, by E. C. Cushing and D. C. Farman (pp. 313–322); Nutritional Diseases of Farm Animals, by L. L. Madsen (pp. 323–353); and Plants Poisonous to Livestock, by W. T. Huffman and J. F. Couch (pp. 354–373).

Part 3. Common diseases and parasites of horses and mules.—Equine Encephalomyelitis, by L. T. Giltner and M. S. Shahan (pp. 375–391); Equine Infectious Anemia, or Swamp Fever, by C. D. Stein (pp. 392–401); Periodic Ophthalmia of Horses, by L. O. Mott and H. R. Seibold (pp. 402–408); Glanders (pp. 409–412) and Dourine (pp. 413–416), both by T. W. Cole; Miscellaneous Diseases of Equines, by L. O. Mott, M. S. Shahan, L. T. Giltner, and A. H. Frank (pp. 417–458); Internal Parasites of Horses and Mules, by A. O. Foster (pp. 459–475); Mange in Equines, by M. Imes (pp. 476–481); Horse Bots and Their Control, by F. C. Bishopp and B. Schwartz (pp. 482–491); and Some Insect Pests of Horses and Mules, by F. C. Bishopp (pp. 492–500).

PART 4. Diseases and parasites of cattle.—Brucellosis of Cattle, by E. Lash and H. M. O'Rear (pp. 501–511); Johne's Disease, by B. T. Simms, W. M. Mohler, and H. W. Johnson (pp. 512–517); Bovine Mastitis, by W. T. Miller (pp. 518–522); Blackleg, by W. M. Mohler (pp. 523–525); Shipping Fever, or Hemorrhagic Septicemia, by C. D. Stein (pp. 526–532); Milk Fever (pp. 533–536) and Paint Poisoning in Cattle (pp. 642–644), both by L. T. Giltner; Miscellaneous Diseases of Cattle, by G. T. Creech, R. L. Knudson, and O. L. Osteen (pp. 537–564); Cattle

Coccidiosis, by D. C. Boughton (pp. 565-571); Cattle Tick Fever, by W. M. MacKellar (pp. 572-578); Anaplasmosis—a disease of cattle, by G. W. Stiles (pp. 579-587); Cattle Scab and Its Control, by R. Snyder (pp. 588-592); Tapeworm and Roundworm Parasites of Cattle, by D. A. Porter (pp. 593-604); Bovine Genital Trichomoniasis, by G. Dikmans (pp. 605-611); Cattle Grubs, or Heel Flies, by E. W. Laake, F. C. Bishopp, and R. W. Wells (pp. 612-619); The Stablefly, by F. C. Bishopp and E. W. Laake (pp. 620-625); The Horn Fly, by W. G. Bruce (pp. 626-630); Cattle Lice, by O. G. Babcock and E. C. Cushing (pp. 631-635); Cattle Injuries Caused by Ingesting Foreign Objects, by L. T. Hiltner and J. A. Patton (pp. 636-641); and Nutritional Diseases of Cattle, by L. L. Madsen (pp. 645-672).

Part 5. *Diseases and parasites of swine*.—Hog Cholera, by C. N. McBryde (pp. 673-685); Swine Erysipelas, by H. W. Schoening, C. G. Grey, and O. L. Osteen (pp. 686-694); Enteritis of Swine (pp. 695-702) and Swine Influenza (pp. 703-713), both by C. N. Dale; Miscellaneous Diseases of Swine, by G. T. Creech (pp. 714-728); Brucellosis (Infectious Abortion) in Swine, by A. Eichhorn (pp. 729-733); Mange of Swine, by M. Imes (pp. 734-740); Hog Lice, by O. G. Babcock and E. C. Cushing (pp. 741-744); Internal Parasites of Swine, by L. A. Spindler (pp. 745-786); Trichinosis, by B. Schwartz (pp. 787-802); Salt Tolerance and Salt Poisoning of Swine, by N. R. Ellis (pp. 803-809); and Nutritional Diseases of Swine, by L. L. Madsen (pp. 810-827).

Part 6. *Diseases and parasites of sheep and goats*.—Foot Rot of Sheep (pp. 829-834); Sore Mouth of Sheep and Goats (pp. 835-838); Miscellaneous Diseases of Sheep and Goats (pp. 839-858), and Pregnancy Disease of Sheep (pp. 923-926), all by M. S. Shahan; Internal Parasites of Sheep and Goats, by G. Dikmans and D. A. Shorb (pp. 859-903); Sheep Scab and Its Control, by A. W. Miller (pp. 904-911); Sheep Ticks, by M. Imes and O. G. Babcock (pp. 912-916); Goat Lice, by O. G. Babcock and E. C. Cushing (pp. 917-922); and Lung Disease of Sheep, by G. T. Creech (pp. 927-929).

Part 7. *Common diseases and parasites of poultry*.—Pullorum Disease (pp. 931-943), Fowl Pox (Diphtheria) (pp. 977-986), and Miscellaneous Diseases of Poultry (pp. 993-1006), all by H. Bunya; Fowl Paralysis and Other Forms of the Avian Leukosis Complex, by C. A. Brandly, N. F. Waters, and W. J. Hall (pp. 944-962); Respiratory Diseases of Chickens and Turkeys, by W. J. Hall (pp. 963-976); Psittacosis, by K. F. Meyer (pp. 987-992) (coop. Univ. Calif.); Internal Parasites of Poultry, by E. E. Wehr and J. F. Christensen (pp. 1007-1040); Coccidiosis of the Chicken, by J. F. Christensen and E. A. Allen (pp. 1041-1047); Poultry Lice and Their Control (pp. 1048-1054), Poultry Mites (pp. 1055-1061), The Fowl Tick (pp. 1062-1067), and The Pigeon Fly (pp. 1072-1074), all by F. C. Bishopp; Bedbugs as Pests of Poultry, by E. A. Back and F. C. Bishopp (pp. 1068-1071); and Nutritional Diseases of Poultry, by H. W. Titus (pp. 1075-1107).

Part 8. *Common diseases and parasites of dogs and cats*.—Rabies and Its Control, by H. W. Schoening (pp. 1109-1123); Distemper of Dogs (pp. 1124-1129), Feline Enteritis (pp. 1130-1133), Miscellaneous Diseases of Dogs and Cats (pp. 1134-1149), Running Fits (Fright Disease) (pp. 1193-1195), and Nonparasitic Skin Diseases of Dogs and Cats (pp. 1196-1202), all by C. D. Stein; Internal Parasites of Dogs and Cats, by E. W. Price and P. D. Harwood (pp. 1150-1173); Mange of Dogs, by E. W. Price and F. C. Bishopp (pp. 1174-1179); Ticks Affecting Dogs, by F. C. Bishopp and C. N. Smith (pp. 1180-1187); Fleas, by F. C. Bishopp (pp. 1188-1192); and Nutritional Diseases of Dogs and Cats, by I. P. Earle (pp. 1203-1215).

Part 9. Wildlife diseases and parasites.—Diseases of Wildlife and Their Relationship to Domestic Livestock (pp. 1217-1225), Diseases of Farm-Raised Game Birds (pp. 1226-1231), and Diseases of Fur Animals (pp. 1232-1238), all by J. E. Shillinger.

Many of the contributions include references to the literature cited.

[**Work in animal pathology and parasitology by the Missouri Station**] (*Missouri Sta. Bul.* 444 (1942), pp. 46-47, 88-92).—Reports of progress (E. S. R., 87, p. 108) of work by H. A. Herman, R. G. McCarty, F. J. Olney, A. J. Durant, H. C. McDougale, C. Elder, and O. S. Crisler are given on the effect of sulfanilamide on udder streptococci of dairy cows; leucosis in fowls; heat therapy for blackhead disease in turkeys; cecal ablation for the control of blackhead in turkeys; fowl paralysis; pathology and comparative damage done by stomach, nodular, and tapeworms in sheep; transmission of Bang's abortion infection from swine to cattle under pasture conditions; toxemia in sheep; comparative results obtained with the tube agglutination and rapid or plate tests on low reacting sera in Bang's disease testing; low agglutination reactions in unbred virgin gilts; and a study of cattle that consistently give low titer reactions to the Bang agglutination test.

[**Work with animal diseases by the Nebraska Station**] (*Nebraska Sta. Rpt.* [1941], pp. 65-68).—The progress (E. S. R., 86, p. 87) of work with anti-swine-erysipelas serum, by L. Van Es and J. F. Olney, and hog cholera immunity is briefly reported upon.

[**Work in animal pathology and parasitology by the Texas Station**]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1941, pp. 91-94, 94-95, 110-112, 156-159).—Reports of progress (E. S. R., 86, p. 243) of work at the station and substations by H. Schmidt, R. D. Turk, O. C. Copeland, C. N. Shepardson, F. P. Mathews, A. L. Darnell, P. L. Piercy, C. A. Woodhouse, J. J. Reid, J. B. Boughton, and W. T. Hardy are given on infectious bovine abortion, loco weed poisoning, jimmies in sheep and goats, poisonous plants in the Davis Mountains, mastitis investigations, a new disease of cattle characterized by a nervous disorder, hemoglobinuria, photosensitization of animals manifested by widespread inflammation of the skin, anaplasmosis in cattle, the relationship of the Gulf Coast tick to screwworm infestation in livestock and methods for its control, keratitis of cattle, investigation of gastrointestinal parasites in cattle, soremouth (contagious ecthyma) of sheep and goats, stomach worms (*Haemonchus contortus*) of sheep and goats, hard yellow livers of sheep and cattle, sporadic bovine encephalomyelitis, infectious enterotoxemia (milk colic) of lambs, and feeding trials to determine toxicity of *Acacia berlandieri* and other suspected plants.

Studies on the nature of Anaplasma, J. C. Lotze and M. J. YIENGST. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 312-320, figs. 17).—"The order and regularity of the occurrence of the different-sized and morphologic types of anaplasms in the course of anaplasmosis suggest that the anaplasma is a parasite which invades the erythrocyte, undergoes a period of growth, and eventually undergoes multiple division resulting in the production of eight small, spherical bodies in each anaplasma. The rapid disappearance of the large, irregular-shaped anaplasms from the blood stream of the host animal suggests that anaplasms are in some way responsible for the destruction of the erythrocytes containing them. Evidence from tabulations of infected erythrocytes based on the size of the anaplasms indicates that an infected erythrocyte does not remain in the blood stream of the host longer than 3 to 4 days. The occurrence of a certain extra-erythrocytic body during the anaplasma phase of the disease and the attachment of this structure to mature erythrocytes only, usually in a mar-

ginal position on the erythrocytes, suggests that this form constitutes the stage of the parasite which enters the erythrocyte and develops into the anaplasma."

Phenol as a preservative for equine encephalomyelitis brain tissue, R. GWATKIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 7, pp. 191-196).—In the experimental work reported the encephalomyelitis virus was found to be active in the brains of two guinea pigs, the skinned heads of which had been stored in 1 percent phenolsaline, one at room temperature and one in the refrigerator, for 6 days. Brains from normal guinea pig heads stored for 3 and 4 days at 37° C. in phenolglycerine and phenolsaline solutions were innocuous for guinea pigs by intracerebral injection. The controls in glycerine and saline solutions were putrid at that time. There was some suggestion of lowered virus activity in the higher dilutions of brain suspension exposed to 1 percent phenol for 2 and 5 days, as manifested by delay in the death of injected animals. Intracerebral injections of 0.2 cc. of brain suspension containing 1 percent phenol caused the death of several guinea pigs. Replacements which received the same dose all lived. Two halves of a guinea pig brain preserved in glycerine and phenolglycerine solutions revealed no appreciable difference in virulence after 6 days at room temperature. The unskinned heads of two gophers in buffered glycerine solution, with and without phenol, both became putrid at 37°. Phenol in a concentration of 0.5 percent did not prevent the development of bacteria in brains when the heads were held for 4 days at 37°. Ice is considered to be the best method of preserving brains or heads for examination for the presence of equine encephalomyelitis virus, but if this is not obtainable these experiments suggest that 1 percent phenol might safely be added to buffered glycerine solution or saline for the preservation during transport of skinned heads of small animals and birds or for brains or portions of brains of large animals.

John's disease in Arkansas (*Arkansas Sta. Bul.* 417 (1942), pp. 10-12).—A brief account of work by Eveleth and Gifford with this disease in Arkansas, where it was discovered in sheep (*E. S. R.*, 87, p. 716).

Infectious laryngotracheitis, its diagnosis and control, C. H. WEAVER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 4, pp. 107-115, figs. 5).

Further studies on the histology of the bovine kidney, R. F. LANGHAM, R. T. INGLE, and E. T. HALLMAN. (*Mich. Expt. Sta.*). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 260-267, figs. 9).—A report of further work (*E. S. R.*, 81, p. 713).

The toxicity of foliage of *Aleurites fordii* for cattle, M. W. EMMEL, D. A. SANDERS, and L. E. SWANSON. (*Fla. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 785, pp. 136-137).—Report is made of the loss from a herd of 44 well-fed purebred Hereford and Aberdeen-Angus cattle of 14 that died as a result of eating the foliage from branches of the tung oil tree (*A. fordii*) that had been discarded in their pasture. Two heifers force-fed macerated tung leaves (1.25 and 1.75 lb., respectively) and 1 cow which voluntarily ate picked foliage developed symptoms of poisoning. The outstanding symptoms of poisoning by tung tree leaves in cattle consisted of hemorrhagic diarrhea which usually became more or less watery, loss of appetite, listlessness, unthriftiness, and emaciation. Symptoms occurred 3 to 5 days after exposure and 1 animal lingered 3 weeks before dying. The most pronounced post-mortem lesions were hemorrhagic gastroenteritis and passive congestion of the visceral organs. Granular degeneration with small scattered areas of necrosis were predominant in the tissues of the visceral organs, particularly of the liver, kidneys, and intestines.

Incidence of gastrointestinal nematodes of cattle in the southeastern United States, D. A. PORTER. (*U. S. D. A.*). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 304-307, 308).—Report is made of partial or complete examinations of

the abomasum, small intestine, and large intestine of 84 cattle, ranging in age from 1 to 18 mo., from Alabama, Georgia, Florida, Mississippi, and Louisiana. In some instances only the stomach was examined and in others only the intestine. Fifteen species of nematodes representing 10 different genera were recovered. The numbers of specimens were counted or estimated in most cases. The percentage incidence of the various species was: *Cooperia punctata* 91, *Haemonchus contortus* 83, *Ostertagia ostertagi* 74, *Bunostomum phlebotomum* 62, *Oesophagostomum radiatum* 59, *Trichostrongylus axei* 47, *Trichuris* spp. (*T. ovis* and *T. discolor*) 44, *C. pectinata* 32, *Strongyloides papillosus* 21, *H. similis* 18, *Nematodirus helvetianus* 15, *C. oncophora* 11, *Trichostrongylus colubriformis* 9, and *Cupillaria longipes* 7.

Sporadic bovine encephalomyelitis: Filtration of the causal agent, T. W. STEARNS and S. H. McNUTT. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 253-257.)—Report is made of the results of studies on the filtration of the agent of sporadic bovine encephalomyelitis. Of 34 filtration trials with Berkefeld N or V candles, 15 filtrates were found to contain sufficient agent to infect guinea pigs, 3 were questionable, and the remainder were negative. Assays in chick embryos before and after filtration indicated an almost complete loss of the causal agent during filtration. Assays of unfiltered material killed embryos in dilutions as high as 1:1,000,000,000. Evidence is presented that the addition of suspensions of liver and spleen of the normal guinea pig to filtrates increases the possibility of infecting guinea pigs with filtrates of the causal agent.

The relation of flies (*Musca domestica* Linnaeus) to the transmission of bovine mastitis, H. E. EWING, JR. (Univ. Del.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 295-299.)—In transmission experiments, the details of which are given in tables, it was possible for the housefly to carry *Streptococcus agalactiae* externally and internally. This organism and pathogenic staphylococci were found at the external surfaces of the teat sphincters in nearly all of the mastitic animals examined. It was considered unlikely, however, that the houseflies trapped in the dairy barn and studied in the investigation would have been important as agents for the transmission of bovine mastitis.

Homogenized sulfanilamide-in-oil intramammary injections in bovine mastitis, J. C. KAKVAS, C. C. PALMER, J. R. HAY, and E. S. BIDDLE. (Univ. Del.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 274-284, fig. 1.)—Report is made of the chemotherapeutic properties of sulfanilamide when administered directly into the bovine mammary gland for the treatment of streptococcal and staphylococcal mastitis. Light liquid petrolatum was found to be a suitable vehicle for incorporating and administering the drug. Description is given of a method for the preparation of the homogenized sulfanilamide and the procedure for intramammary injections.

"In streptococcal mastitis the dosage recommended for an average size udder is 40 cc. of the homogenized product given daily for 4 days. If the infection persists the treatment should be repeated and the daily dose may be increased to 80 cc. with safety. This applies both to lactating and nonlactating cows. In staphylococcal mastitis the dose recommended is 80 cc. of the product given daily for 4 days and repeated if indicated. The homogenized sulfanilamide as used in these experiments was well tolerated and readily absorbed by the mammary gland. It can be used in acute, subclinical, and chronic forms of mastitis. No contraindications have been found. There was no decrease in milk production during or after treatment. One hundred and three cows were treated for streptococcal mastitis by intramammary injections with homogenized sulfanilamide. One hundred of these were infected with *Streptococcus agalactiae* and 3 were infected with *S. uberis*. Based on bacteriological findings,

cures were effected in 92 cows (89.3 percent) and partial or no improvement in 11 cows (10.7 percent). Breaking down the results into quarters treated, of the total 265 quarters, 251 (94.7 percent) were cured and 14 (5.3 percent) were not cured. In acute and chronic mastitis caused by pathogenic staphylococci, promising results were obtained in preliminary trials from intramammary use of homogenized sulfanilamide." Sulfathiazole similarly prepared was found capable of destroying the infection within the udder, but was objectionable owing to the formation of plugs which temporarily occlude the teat duct.

A list of 24 references to the literature is included.

The eradication of streptococcic mastitis by treatment with tyrothricin, F. E. MARTIN (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 784, pp. 23-25).—In a herd of 71 cows 49 were found to be infected in 130 quarters with long chain streptococci, diagnosis having been made by the incubated smear technic. Treatment consisted in the instillation of tyrothricin into the quarter and repeated as indicated, the administration having been made during all stages of lactation. Of 130 infected quarters 90 percent were cured, requiring an average of 2.3 treatments per quarter. The reactions from tyrothricin in an oil emulsion were slight when small doses were employed.

Calfhood vaccination in a brucellosis control program in certified dairies, C. W. BONYNGE (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 785, pp. 120-123).

The use of sulfonamides in the treatment of calf diphtheria, J. FARQUHARSON (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 785, pp. 88-92, fig. 1).—The statistical, clinical review of a series of 76 cases of calf diphtheria presented emphasizes the excellent results obtained from sulfonamide therapy. The author has found sulfapyridine to be the drug of choice in the treatment of calf diphtheria in which *Actinomyces necrophorus* is either the primary or secondary agent.

Studies on sheep, with the demonstration of Pasteurella localized in the central nervous system, H. E. BIESTER, L. H. SCHWARTZ, and R. A. PACKER. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 268-273, figs. 7).—Report is made of the recovery of *Pasteurella* organisms during an epizootic among sheep which manifested clinical symptoms characteristic of a central nervous disturbance. The organisms were recovered from the brain of experimentally inoculated animals and in one case by direct inoculation of a bacteriologic medium with a suspension of infectious brain material. One or more nutritional factors were believed to be contributory in the course of the disease. The pathology of the brain was distinct from that associated with ovine listeriosis. The organisms recovered were identical to those of *P. multocida* group II as classified by Rosenbusch and Merchant (E. S. R., 80, p. 822).

Tularaemia in sheep, R. GWATKIN, R. H. PAINTER, and I. W. MOYNIHAN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 6, pp. 163-168, figs. 2).—The occurrence of tularemia in a band of 850 yearling ewes in southern Alberta, in which 24 died and 5 or 6 seriously affected animals recovered, is reported upon. All the ewes examined were heavily infested with the Rocky Mountain spotted fever tick *Dermacentor andersoni* Stiles. The tularemia organism (*Pasteurella tularensis*) was recovered from 1 sheep on autopsy, from engorged ticks taken from it, and also from engorged ticks taken from another sheep which had been ill for 10 days and was recovering. Serum of this animal showed complete agglutination in 1:400, almost complete in 1:800, and partial in 1:1,600. The outbreak lasted only 5 days, and its cessation coincided with disappearance of ticks, which earlier were reported to have been unusually heavy.

Phenothiazine-medicated pellets for range sheep, E. C. McCULLOCH. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 785, pp. 114-119, fig. 1).—The author has found that phenothiazine-medicated pellets afford a practical, convenient, and reasonably efficacious method of treating range sheep infested with *Haemonchus contortus* and *Trichostrongylus colubriformis* in the abomasum. For the individual medication of sheep with phenothiazine or for the preparation of phenothiazine suspensions, a mixture of 5 parts of phenothiazine with 4 parts of molasses forms a convenient and practical mass.

Tests with nicotinic acid for the prevention of infectious swine enteritis, B. H. EDGINGTON, W. L. ROBISON, W. BURROUGHS, and R. M. BETHKE. (Ohio Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 785, pp. 103-108).—The data presented led to the conclusion that the protective value of nicotinic acid against *Salmonella choleraesuis* infection is not sufficient to encourage its use as a specific preventive or curative measure for this type of bacterial infection of swine.

The in vitro neutralization of hog-cholera virus with hog-cholera antiserum, H. C. H. KERNKAMP and M. H. ROEPKE. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 300-303).—The results of experiments, reported in tables, have shown that an in vitro neutralization of hog cholera virus by hog cholera antiserum does occur. When mixtures of virus and serum were incubated for 1 hr. at 37.5° C. it required approximately five times as much antiserum as virus to effect a neutralization, whereas when incubated for a longer period (5 hr.) about an equal amount of antiserum and virus resulted in neutralization.

Swine erysipelas, L. VAN ES and C. B. McGRATH (*Nebraska Sta. Res. Bul.* 128 (1942), pp. 43, figs. 5).—A revision of Research Bulletin 84 (E. S. R., 76, p. 251).

Ascorbic acid in certain body fluids of horses, B. J. ERRINGTON, W. S. HONGKISS, and E. P. JAYNE. (Ky. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 242-247).—The results of ascorbic acid analyses of the blood plasma, semen, spinal fluid, and the aqueous and vitreous humors of horses are reported upon, the details being given in tables. They indicate that horses do not assimilate ascorbic acid when it is administered by mouth. No correlation was observed between the ascorbic acid content of the blood plasma and that of the other fluids examined. There is a tendency for a decrease in the ascorbic acid content of the spinal fluid and the eye fluids in local inflammatory processes. In cases of periodic ophthalmia there was a decrease in the ascorbic acid of the aqueous humor of 58.5 percent from the average normal.

Whitebrush (*Lippia ligustrina*) poisoning in horses, F. P. MATHEWS. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 784, pp. 35-38, figs. 2).—An investigation of losses in horses that have for many years occurred in various parts of Texas, particularly in Val Verde, Kinney, and Uvalde Counties and were attributed to the grazing on white brush, led to feeding experiments in which two horses that browsed upon this plant suffered from the toxic effects and later succumbed. The symptoms consisted of emaciation, leg weakness, and incoordination. A calf that was kept in the same enclosure for 56 days developed the same emaciation but no other evidence of toxic effects. Two sheep and a goat kept in the enclosure for 79 days suffered no ill effects.

Significance of inclusion bodies of distemper, W. WISNICKY and L. WIPF. (Wis. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 285-288, figs. 5).—It was found that distemper inclusion bodies provide an invaluable aid in diagnosing distemper, although there are conditions when the presence of several

kinds of inclusionlike bodies may confuse the diagnosis. The necessity for basing the diagnosis on history, clinical picture, post-mortem gross appearance, and the presence of characteristic inclusion bodies is emphasized.

Interspecies transmission of avian leucosis in embryos, M. POLLARD and W. J. HALL. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 247-252, figs. 6).—The virulence of the leucosis agent was little affected by passage into turkey, guinea fowl, quail, and pheasant embryos. The reason for its marked exacerbation when passed successfully through two series of duck embryos is as yet speculative. The postinoculation period in quail embryos was relatively short, but this might be attributed to the small size of the embryo, the dosages for all of these species being between 0.05 to 0.1 cc. of "leucotic" blood. "Zigzag" passages from the chick embryo to the turkey embryo and then back to the chick embryo, even when repeated several times, induced no marked alteration in the character of the leucotic response. There was no attenuation of virulence when passed through turkeys as reported by K. Järnai.¹ The disease has been transferred in ovo from the chick to the turkey and from the turkey to the duck, guinea fowl, and quail. It has similarly been transferred from chicks to pheasants and from the latter species to quail and from chicks to guinea fowls and from the latter to pheasants. It has been transferred through three generations in turkey embryos, two in ducks, and two in the guinea fowl embryos. Leucosis was induced in 22.8 percent of 57 turkey poults and in 1 pheasant chick which were inoculated. .

Vinylite-resin-corrosion preparations in the study of the avian leucosis complex, G. E. COTTRAL. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 227-234, figs. 4).—A description is given of the technic for using vinylite resin to prepare corrosion casts of the vascular systems of organs of the domestic fowl.

Serial passage of lymphomatosis-osteopetrosis in chickens, C. A. BRANDLY, N. M. NELSON, and G. E. COTTRAL. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 289-295, figs. 4).—Report is made of work in which six serial passages were accomplished in chickens with the strain 3 agent of lymphomatosis-osteopetrosis.

Respiratory-nervous disorder in eight-months old pullets, D. E. STOVER (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 239-241, figs. 4).—Report is made of a disorder in 70 percent of a flock of 750 birds, of which 6 succumbed. The symptoms were blueness of the comb, droopiness, inappetence, and a tendency for many of the birds to remain on the roosts. Egg production dropped from 64 to 17 percent, and a number of soft-shelled eggs were laid.

Laying hens poisoned by calcium oxide (quicklime), G. W. STILES. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 784, pp. 20-23, figs. 2).—The loss of about 20 percent of a flock of 90 hens was shown in experimental work to have been due to the consumption of an overdose of lumpy quicklime spread over the drop boards and in the litter. As a means of prevention it is recommended that quicklime be used only in a finely powdered form well spread over the premises. Recovery in sick fowls was hastened after they received dilute vinegar treatment.

Possible irritating effects from dusting baby chicks and growing and adult fowls with hypochlorite powders, S. M. COSTIGAN (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 235-239, figs. 3).—It was found that dusting with hypochlorite powders chicks affected with infectious bronchitis or older birds with bronchitis, laryngotracheitis, or coryza did not cause more severe inflammation than that produced by the infective agents. Pullorum-infected chicks whose lungs were

¹ Arch. Wiss. u. Prakt. Tierheilk., 70 (1935), No. 1, pp. 32-70.

involved were not adversely affected by the dusting, as was shown by the higher mortality in the control birds.

The relationship of infectious omphalitis of poults and impetigo staphylogenes in man, R. B. WILLIAMS and L. L. DAINES (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 784, pp. 26-27, 28).—Report is made of an investigation of the 20- to 30-percent loss of poults that occurred at a hatchery operating forced-air type incubators with a combined capacity of 43,000 turkey eggs. The findings are said to be in agreement with those of Volkmar (E. S. R., 62, p. 566) and Brandly (E. S. R., 68, p. 534). It is concluded that the infection originated within the hatchery and that the etiological agent was a strain of *Staphylococcus aureus*. The endemic occurrence of impetigo and sore throats among men employed in the hatchery and the brooding houses, the isolation of a strain of *S. aureus* routinely from the coagulated heart blood of the poults, the isolation of a similar organism from an employee working as a herder of young turkeys, and the necessity for operators to work within the incubators furnished evidence that this organism was the cause of the loss.

Intestinal cultures for detecting salmonellosis in young turkeys, J. J. POSELL (*Amer. Jour. Vet. Res.*, 3 (1942), No. 8, pp. 257-259).—Of 100 lots totaling 366 young turkeys that were cultured, and the isolations of *Salmonella* organisms from the intestines compared to those from other organs, 40 lots and 112 birds were positive. Eleven species of *Salmonella* other than *S. pullorum* were isolated. Pullorum disease was not detected by intestinal cultures and missed by the remaining cultures in any one lot. Paratyphoid infection was detected by intestinal cultures and missed by the remaining cultures in one-third of the lots. It is concluded that instances in which paratyphoid organisms are recovered solely from the intestinal tracts may represent true infections. Routine examination of young turkeys should include intestinal cultures.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 16-17, 18, 19, 20).—These included experiments to show cost of various methods of handling cornstalks for conversion into artificial manure, by J. C. Wooley and R. Beasley; on the proper size, depth, and spacing of tile drains for Missouri soils, by Wooley; on the use of electricity in the brooding of chicks, by M. M. Jones; and on combine harvesters in Missouri, by Jones, Beasley, and L. E. Hightower.

[Agricultural engineering investigations by the Nebraska Station]. (Partly coop. U. S. D. A.). (*Nebraska Sta. Rpt.* [1941], pp. 68-73, 82).—Studies of electric power on Nebraska farms are noted by E. E. Brackett and F. D. Yung; methods of cooling milk on the farm and their effect on quality, by H. P. Davis and P. A. Downs; mechanical equipment needed for the eradication of bindweed, and mechanical equipment, power, and labor required in Nebraska for the production of corn, both by C. W. Smith; adaptation of insulated electric brooders in uninsulated poultry houses, by Yung and F. E. Mussehl; pig brooders, by Yung; an evaporative egg cooler, an insulated water-cooled egg storage cabinet, and a fruit and vegetable dehydrator, all by Brackett, Yung, Davis, Downs, and Mussehl; and pump irrigation, by H. E. Weakly.

[Agricultural engineering investigations by the Texas Station] (*Texas Sta. Rpt.* 1941, pp. 6-8, 43-44).—Mechanical harvesting of cotton is reported upon by H. P. Smith, D. T. Killough, D. L. Jones, and M. H. Byrom; efficiency in distribution and placement of cottonseed and fertilizer, and atmospheric ex-

posure of wire and fencing, both by Smith and Byrom; garlic drying, by Smith, Byrom, and G. E. Altstatt; and land use in relation to sedimentation in reservoirs in the Trinity River Basin, by [A. N.] Garin and L. P. Gabbard (coop. U. S. D. A.).

Methods for determining permeability of water-bearing materials, with special reference to discharging-well methods, L. K. WENZEL (*U. S. Geol. Survey, Water-Supply Paper 887 (1942), pp. VI+192, pls. 6, figs. 17*).—This report outlines the general methods for determining permeability and includes some of the more widely used variations of each. It includes a section on direct laboratory methods and a bibliography of literature on permeability and laminar flow, by V. C. Fishel, and a list of organizations in the United States that make permeability tests.

Four pumping tests to determine the permeability of water-bearing materials were made in Nebraska, in connection with an investigation of the ground-water resources of the State by the Federal Geological Survey in cooperation with the conservation and survey division of the University of Nebraska. Observations on the fluctuations of the water level in many observation wells gave information on the behavior of the water level in the vicinity of discharging wells. The Federal Geological Survey in cooperation with the Kansas Geological Survey made a similar pumping test in the Arkansas River Valley, near Wichita, Kans., in 1937. The permeability of the water-bearing materials at the location of each of the five tests was computed by several of the discharging-well formulas outlined. The permeabilities so determined for any one test agree within about 5 percent. Descriptions of the pumping tests and of the permeability computations are included, together with records of the draw-down of the water level in observation wells in the tested areas in Nebraska.

Water levels and artesian pressure in observation wells in the United States in 1940, parts 1-6, O. E. MEINZER, L. K. WENZEL, ET AL. (*U. S. Geol. Survey, Water-Supply Papers 906 (1942), pp. III+226, figs. 10; 907 (1942), pp. IV+120, figs. 9; 908 (1942), pp. IV+288, figs. 7; 909 (1941), pp. III+208, figs. 7; 910 (1941), pp. [3]+184, fig. 1; 911 (1941), pp. IV+240, figs. 15*).—This series of records was published in the form of one volume per year up to 1939 (E. S. R., 85, p. 542), but an increase in the number of observation wells and the quantity of water level pressure data available have so far increased as to make it advisable to subdivide the 1940 records here noted into six volumes, dealing respectively with the Northeastern, Southeastern, North Central, South Central, and the Northwestern States, and with the Southwestern States and the Territory of Hawaii.

Surface water supply of the United States, 1940, parts 4, 6, 7, 10, G. L. PARKER et al. (*U. S. Geol. Survey, Water-Supply Papers 894 (1941), pp. V+213, pl. 1; 896 (1942), pp. VIII+457, pl. 1; 897 (1941), pp. VI+349, pl. 1; 900 (1941), pp. IV+125, pl. 1*).—These papers record measurements of stream flow for the year ended September 30, 1940, No. 894 covering St. Lawrence River Basin, No. 896 the Missouri River Basin, No. 897 the lower Mississippi River Basin, and No. 900 the Great Basin.

Water resources for rice irrigation (*Arkansas Sta. Bul. 417 (1942), pp. 6-7*).—This brief discussion of studies by K. Engler indicates that the use of surface water in quantities sufficient to diminish the decline of ground-water level in neighboring wells is in some instances possible, and that there are some other advantages in the use of surface water for rice irrigation.

Control of microorganisms by ultraviolet irradiation, H. STIERLI. U. S. D. A.). (*Agr. Engin., 23 (1942), No. 8, pp. 262-265, figs. 6*).—Hot cathode and cold electrode germicidal lamps were used in tests on commercial hydrocoolers.

Although a relatively large number of lamps were used and two methods of placement (in air above the water or immersion directly in the water) were tried, no satisfactory control of micro-organisms was obtained. In both cases, but especially with the immersed lamp, the low temperatures necessary for precooling sharply reduce the ultraviolet output and life. Immersed operation may be improved by enclosing the lamp in a special ultraviolet-transmitting glass. At this time it seems impractical to use ultraviolet radiation for control of micro-organisms in precooling water because of the large number of germicidal lamps necessary for the production of sufficient ultraviolet intensity.

Relation of drainage to the victory program of agriculture, J. G. SUTTON. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 8, pp. 249-250, 252, figs. 2).—The author calls attention to the damage done during the preceding war, and not yet fully repaired, by the plowing up and subsequent wind erosion of large areas of the plains. Much of the increased production needed in the present war can be carried out with suitable drainage measures on lands now too wet for use and within the limits of an expenditure which will make this an important contribution to the war effort. It is important, however, that the scope of drainage which should be carried on as a war measure be specifically defined to avoid criticism that the drainage of swamps and undertaking of large new projects entails.

The relation of water management to grassland farming, C. L. HAMILTON. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 8, pp. 245-246, 248, fig. 1).—The author finds, in part, that without some degree of grassland farming a lasting solution for many of the water problems in agriculture becomes impractical. Permanent vegetative cover is often the only profitable solution for acute water erosion wastage. In other instances profitable grass or crop production is dependent upon drainage, runoff diversion, moisture retention, or supplemental irrigation or other water-corrective measures. The success of one practice usually depends upon the other. Mechanical measures frequently fail if not supported by proper vegetal measures. Similarly vegetative measures fail when mechanical aids are ill-suited or inadequate.

The relation of grassland farming to soil and water conservation, F. G. BELL. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 8, pp. 247-248).—Pointing out a confusion in the use of the term "grassland farming," the author defines such a farming system as one involving the use of grass as the major production element in the cropping system or a method of farming in which grasslands are considered as the basic unit of land use on the farm, the definition in either form being understood not to exclude entirely the growing of cultivated crops. The value of such a system from the viewpoint of soil and water conservation is taken as generally accepted. This discussion is concerned mainly with the economic problems involved. It is concluded, in part, that when the maximum capabilities of grass, as a crop, are understood and effectively used, it may be hard to justify, on either a conservation or economic basis, any other type of land use for the very large acreage of land on which an erosion hazard exists.

Machinery in Britain's food production campaign, C. I. C. BOSANQUET (*Agr. Engin.*, 23 (1942), No. 8, pp. 260-261).—Use of farming machinery on an increasing scale has made possible in England a 50-percent increase in the acreage of arable land and a food production increase of about 30 percent. One of the striking facts brought out in this summary of the current British agricultural situation is that the agricultural machinery supplied from the United States produces in the first 12 mo. between 7 and 10 times the combined weight of the equipment itself and of the fuel and oil consumed in its use in

human food. Use of Government-owned machinery for the working of land which does not justify owner-purchase of machinery (mainly because the land now tilled will be returned to grass after the war) is one of the features of the current agricultural situation noted.

A method of estimating the minimum farm equipment requirements for 1943. J. B. DAVIDSON. (Iowa State Col.). (*Agr. Engin.*, 23 (1942), No. 8, pp. 251-252, fig. 1).—The 1943 farm equipment requirement estimates must be related specifically to the production objectives for that year. Though not established at the time of writing, these objectives may be expected to include (1) increase in the volume of certain crops (the 1942 objectives having been increased from 88 percent for wheat to 255 percent for peanuts above the production of 1941), and (2) an increase in the acreage of certain new crops, especially new oil and fiber crops. Estimates for the tooling of these increases are considered under the headings repairs, replacement of machines, machines needed for new crops, machines needed for increased production other than that of new crops, equipment needed to counterbalance labor shortages, tractor requirements, and farm equipment needed for export.

Rubber-tired equipment of principal farm machines. A. P. BRODELL and R. A. PIKE (*U. S. Dept. Agr., Bur. Agr. Econ. and Agr. Market. Serv.*, 1942, *F. M.* 29, pp. [2]+7).—"Crop correspondents in February 1941 supplied information relative to the age, type, rubber-tired equipment, fuel consumed, and work performed by their tractors. They estimated the number of tractors of different type on farms in their locality, the extent of use of rubber tires on general-purpose and standard-wheel tractors; the percentage of farmers owning combines, grain binders, mowers, and manure spreaders; and the proportion of these machines that were equipped with rubber tires. Usable returns were received from more than 25,000 crop correspondents who reported on machines for their locality and on more than 17,000 tractors on their own farms. The reports provided complete information as to the age and type of tractor and extent of use of rubber tires for more than 13,000 tractors." The information on the use of rubber tires on tractors and some other farm machines is summarized.

Farm tractors: Type, size, age, and life. A. P. BRODELL and R. A. PIKE (*U. S. Dept. Agr., Bur. Agr. Econ. and Agr. Market. Serv.*, 1942, *F. M.* 30, pp. [2]+15, fig. 1).—This report summarizes the information on types, size, age, and life of farm tractors collected from crop correspondents as noted above.

The drying of young grasses for feed. N. O. BELT (*Agr. Engin.*, 23 (1942), No. 8, pp. 257-259, 261, figs. 4).—High-temperature drying is held more economical than the low-temperature method, producing as good a product or perhaps better. Future developments in driers for forage crops will be on this principle. Coke or coal may be used as a fuel for driers, but gas or oil is preferred for simplicity of operation and regulation of temperature. Cutting and loading machines for handling grasses and forage crops should be further developed. The Redpath harvester was found outstanding in this work and was used to replace the Wilder cut lift combine at Foxden Farm, but it could be further perfected for cutting short grass and the cost reduced by improved design and production methods. Bagging, balling, and storage of dehydrated crops are held to need study and improvement, as do growing, fertilizing, and developing the most suitable grasses and clovers to be used for drying. It is believed very likely that the quality and yields obtained by the application of large amounts of fertilizers would justify the cost. Work so far has shown that dried immature pasture herbage makes a feed of superior quality, and that it can be grown and dried on a farm scale. Further progress is being delayed by the lack of more suitable equipment, which is an engineering problem.

A continuous soil pasteurizer, J. R. TAVERNETTI. (Univ. Calif.). (*Agr. Engin.*, 23 (1942), No. 8, pp. 255-256, 261, figs. 4).—The soil passes from a hopper, having approximately a 5-cu. ft. capacity and provided with agitators, into a 6-ft. length of 4-in. iron pipe around which are wound two 2,500-w. flexible metal-sheathed heating elements. The elements are approximately $\frac{1}{8}$ in. in diameter and 19 ft. long and are wound spirally with about 2 in. between turns. There is a sheet metal casing over the heating elements and the spaces between turns are filled with metal filings. The entire heater is insulated with 4-6 in. of mineral wool. A screw conveyor of 4-in. diameter with a $4\frac{1}{2}$ -in. pitch and 8 ft. long extends through the pipe and a semicircular trough in the bottom of the hopper. It is driven by means of a chain and sprocket from a speed reducer, which in turn is driven by a $\frac{1}{8}$ -hp. electric motor. A thermostat connected in series with the heating units has its sensitive element against the pipe.

The average rate of pasteurizing was approximately 5 cu. ft. of loose soil per hour, or 1 cu. ft. per 1,000 w. of heating capacity. The moisture content of the soil was found an important factor in the proper operation of the machine. The most satisfactory combination of mechanical operation and pasteurizing was obtained when the soil was moist enough not to be dusty but not too wet to crumble readily after being squeezed in the hand. The desirable percentage of moisture varied from as low as 3 or 4 percent with pure sand to as high as 25 or 30 percent with soils containing considerable organic material.

Gearing farm structures to the war effort, D. G. CARTER. (Univ. Ill.). (*Agr. Engin.*, 23 (1942), No. 8, pp. 253-254).—As factors favoring new structures and repairing, the author recognizes (1) relatively high farm income; (2) elimination of much of the competition for this income; (3) continuous change in farm building needs; (4) inadequacy of present structures; (5) the cumulative excess of depreciation over structural and reparative expenditure estimated at \$1,720,000,000 for the past 20 yr.; (6) the wartime emphasis on production, conservation, and labor saving; (7) increased interest on the part of the farmer himself and of the manufacturer, dealer, and the general public; and (8) availability of much noncritical material for farm building. The limitations and restrictions are held to be less of a hindrance with respect to farm building than these have been generally assumed to be. Wartime opportunities for the agricultural engineer to be of increased service in planning and in leadership are considered to be many. Examples are given. A wartime program for farm building advancement is briefly outlined.

Factors affecting temperatures in Southern farmhouses, J. W. SIMONS and F. B. LANHAM. (Coop. Univ. Ga.). (*U. S. Dept. Agr., Tech. Bul.* 822 (1942), pp. 78, figs. 46).—Detailed studies of air and surface temperatures and conditions affecting them in cheap farmhouses of from one to four rooms are reported for both summer and winter. In relatively new frame construction with lapped weatherboarding on the exterior and beaded ceiling lumber on the interior, reducing infiltration of air through walls and around windows and doors to a minimum reduced fuel consumption as much as 30 percent with wind velocities up to 9.7 miles per hour. In like construction 3 yr. old, having lapped weatherboarding without paper or sheathing on the exterior and beaded ceiling lumber on the interior, fuel consumption increases approximately 56 percent with an increase in wind velocity from 3.0 to 9.7 m. p. h. Cottonseed hulls $3\frac{5}{8}$ in. in depth used as ceiling insulation will reduce fuel consumption approximately 25 percent at low wind velocities when used in like construction in three-room houses, and from 18 to 27 percent at wind velocities ranging from 3 to 9

m. p. h. in the types of construction employed in the one-room houses. In a one-room metal house fuel consumption was decreased approximately 50 percent by wall and ceiling insulation of cottonseed hulls. The use of curtain walls to close the spaces between foundation piers reduced fuel consumption from 12 to 20 percent in wood-frame construction as used in the three-room houses with cottonseed-hull ceiling insulation and provision made for reducing air infiltration to a minimum through walls and around doors and windows. With wind velocities up to 9.7 m. p. h., a total fuel saving of as high as 47.8 percent may be obtained by insulating the ceiling of the three-room house with cottonseed hulls (3% in. deep), installing effective wind barriers in the walls and around windows and doors, and providing curtain walls between the foundation piers. Concrete-slab floors laid over gravel fills on the ground maintain more uniform and higher temperatures than wood floors on piers.

Reducing the entrance of solar radiation through window and door openings was found of prime importance in any attempt to maintain lower summer temperatures in low-cost farmhouses. Three coats of white paint on the exterior of wood-frame construction resulted in a small reduction in the average interior wall surface temperature during the day. Air-temperature reduction at the 42-in. level was negligible from the use of ceiling insulation with windows and doors open.

Numerous other measures studied were of little effect in such structures.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the Missouri Station, 1939]. (Partly coop. U. S. D. A.). (*Missouri Sta. Bul.* 444 (1942), pp. 14-16, 39-40, 71).—Results not previously noted are reported as follows: (1) Brief findings by C. H. Hammar and E. S. Troelston as to the decrease from 1927 to the period 1933-38 in farm land values in 13 counties, farm mortgages and foreclosures on lands of different soil types, and the success of Missouri farmers with investments in farm real estate; (2) brief statements by Hammar and N. Clough as to sales turn-over and the types, conditions, etc., of farm buildings in 5 areas studied; (3) findings by B. H. Frame as to financial returns, crop yields, livestock sales, etc., on 59 farms in the Big Creek watershed in the northern part of Harrison County, Mo., and the southern part of Ringgold and Decatur Counties, Iowa; (4) table by Frame showing the relation between crop equipment investment and crop acres in 1937 on 69 Harrison County farms; (5) some records as to cost of seeding, yields of pastures and legumes, costs of silage, etc., on the Hatch Farm of the station, by A. C. Ragsdale and C. W. McIntyre; and (6) table by H. L. Kempster showing by years 1933-38 the average farm price of poultry feeds, average farm price of eggs, pounds of feed 122 eggs would purchase, and the egg: feed ratio.

[Investigations in agricultural economics by the Ohio Station], J. I. FALCONER (*Ohio Sta. Bimo. Bul.* 217 (1942), pp. 145-146).—The table of index numbers of production, prices, and income (E. S. R., 87, p. 584) is brought down through April 1942. Tables show the estimated total tons of different kinds of commercial feeds reaching the retail trade in Ohio in 1929, 1932, 1937, 1939, 1940, and 1941, and the sales by years 1929-41.

[Investigations in farm and ranch economics by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt.* 1941, pp. 40-43).—In addition to findings previously noted, results for studies are reported by W. E. Paulson on the marketing of turkeys, showing the grades, average weights, and prices received for 27,317 birds sold in the 1940 Thanksgiving market, and on the

average margins on grain and supply business of grain elevators, and the percentages of members and directors of cooperative elevator associations that were tenants; by L. P. Gabbard and E. J. Hervey as to inequalities of tax assessments and delinquencies in San Saba County and as to the trend of taxes in representative counties of the State; by H. C. Bradshaw, Hervey, and Gabbard as to savings in local governmental purchasing in four counties resulting from using specifications, centralized purchasing, competitive bidding, etc.; and by J. Motheral and Gabbard as to landlord supervision of the operation of rented land in eastern Texas, the Gulf coast area, and the Panhandle area, the increase from 1939 in the use of written leases, and the changes in farm population during 1940.

Statistical investigation of a sample survey for obtaining farm facts, R. J. JESSEN. (Coop. U. S. D. A. et al.). (*Iowa Sta. Res. Bul.* 304 (1942), pp. 104, figs. 2).—Methods of sampling farm facts in Iowa are presented and discussed.

War and farm work, R. C. TETRO and M. R. COOPER (*U. S. Dept. Agr., Misc. Pub.* 492 (1942), pp. [2]+21, figs. 11).—This discussion is prepared from land-grant college publications and suggestions contributed by farm management specialists of the Bureau of Agricultural Economics. It takes up the farm timetable, fitting the family to the farm, working with neighbors and others, machines and labor saving, and hired labor in their relations to the war needs.

Rationing: A selected list of references, A. M. HANNAY (*U. S. Dept. Agr. Libr. List* 3 (1942), pp. 60).—Included are 286 annotated references on rationing during the present war with a few references to World War I. The references are grouped as general and by countries.

Effects of crop acreage control features of AAA on feed production in 11 Midwest States, T. W. SCHULTZ and O. H. BROWNLEE (*Iowa Sta. Res. Bul.* 298 (1942), pp. 673-696).—The authors estimate that the production of corn in the Midwest in 1938-40 was about the same as in 1928-30 and that the production of corn without crop control would have been only slightly larger than that actually harvested.

Controlling corn and hog supplies and prices, G. SHEPHERD (*U. S. Dept. Agr., Tech. Bul.* 826 (1942), pp. 82, figs. 22).—The location of the heavy corn-producing areas of the United States, the production of hogs, the fluctuation in production and demand for corn and hogs, etc., are discussed. One part of the bulletin deals with the problems of controlling the corn supply and another with controlling the demand for hogs. In the first part, the development of the A. A. A. Ever-Normal Granary program; the size of stabilization stocks; prices, costs, and incomes; and geographical corn loan-rate structure are discussed. The second part deals with whether the demand for hogs can be controlled, the effect of hog-corn prices on hog production, the procedure for meeting changes in the demand for hogs, how the price of hogs may be changed, and whether a controlled system is better than an open-market system.

Some of the findings and conclusions were: "Practically complete stabilization for all emergencies over the last 75 yr., except for the one period from 1933-36, could have been attained with storage stocks not exceeding a billion bushels at any time. A program for the future could get along very well with storage stocks of 700 or 800 million bushels, if hybrid corn reduces the effects of drought and if control of production is effective. . . . If the storage stocks for the country as a whole equaled, for example, 25 percent of the average production of corn, then the stocks in each State should equal 25 percent of the average production of corn in that State, multiplied in each case by a figure representing the severity of fluctuations in corn production in the State. In addition,

the corn should be stored as far north as possible, in order to keep down damage by insects. . . . The corn-storage program would disturb corn-storage practices and relative livestock production in different parts of the Corn Belt less if the existing flat loan rate were replaced by a system of geographical differentials corresponding to average corn-price differentials over the last 15 or 20 yr. An alternative system could be based on average prices at terminal markets and freight rates to those markets. . . . It would be possible to make the stabilization program finance itself, from a banker point of view, by stopping short of complete stabilization and setting the loan rate each year a few cents below the price at which an average crop would sell. The price would then rise enough from large-crop years to short-crop years to cover the costs of storage. But as stabilizing supplies of corn increases gross incomes to farmers from the sale (or feeding) of corn, and also reduces the costs of producing, processing, and distributing livestock, perhaps it would be better to go all the way to complete stabilization. If farmers retained the benefits from this stabilization of supplies, it would seem that they should bear the costs. If, however, production expanded and the benefits were passed on to consumers in the form of more goods at lower prices, it would seem that the costs should be charged to them. It would be well in any case to include a 'life-saver' clause in the formula for determining the loan rate, so that the rate would be reduced automatically if the storage stocks exceeded half a billion bushels or some similar figure. . . .

"Demand cannot be controlled (except to a very limited extent, perhaps 1 or 2 percent, by surplus-disposal programs) without stabilizing the whole economy. Until that is accomplished, the only feasible way to deal with fluctuations in demand for hogs is to meet them with corresponding fluctuations in production of hogs. That will require a more farsighted control of hog production than the open market has afforded in the past, for (1) pork is perishable, and large supplies sell at low prices even though short supplies and high prices may be imminent a few months later, (2) producers respond much more to present prices than to prospective prices, and (3) the decision to increase or reduce the number of hogs going to market must be made at least a year in advance of the time when the market supplies of finished hogs are needed. The hog market can be made more farsighted by Government forecasts of the requirements for pork and lard a year or more in the future, implemented by a guaranteed price for hogs that will call forth the production needed. Risks of financial losses are involved, but they could be minimized if the Government guaranteed only 90 percent of the estimated price, and disposed of any unforeseen surpluses to low-income groups of consumers."

An interpretation of 'parity prices' for Pacific coast egg producers, H. E. ERDMAN and G. B. ALCORN (*California Sta. Mimeog. Rpt. 81 (1942), pp. [2]+44, figs. 18*).—The data are presented and discussed under the following headings: Meaning of the parity figure, the monthly farm prices, index of prices paid by farmers, comparative costs of egg production, feed:egg ratios as indicators of the position of the poultry industry, nature and significance of base period, price ceilings, and regional differences.

Land-use experience in Callaway County, Missouri, A. M. MEYERS, JR., and C. H. HAMMAR. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul. 346 (1942), pp. 56, figs. 19*).—The purpose of this study was "to formulate general conclusions regarding adapted types of land uses in Callaway County. The conclusions are significant to other areas in northeastern Missouri which are characterized by similar problems. These conclusions were derived from a method of analysis in which the county was first subdivided into 33 fairly homogeneous land areas.

The land of each area was then described in terms of its basic characteristics, agronomic adaptations, and present condition with respect to conservation. Because many of these land areas were similar, they were grouped into eight area groups or classes. Farmers' land-use experience, interpreted mainly from records of the Agricultural Adjustment Administration and a survey of farm buildings, was then appraised for each land-area class. Conclusions as to adapted uses of the land in each area class were then drawn by correlating the information regarding the agronomic use capabilities of the land with farmers' experience in using it." The importance of and trends in agriculture in the county, the climate and land resources of the county, and the eight land areas are described. The differences in agriculture—land in farms, type of farming, land-use pattern, size of farms, etc.—are discussed by land-area classes. The relation of character of farm buildings and type of land to farm size and farm land use and of idle land and abandoned buildings to type of land are analyzed and discussed. An appendix includes descriptions of the sources of data and methods of procedure used in obtaining and analyzing the data.

Economic aspects of recreational land use in the Lake of the Ozarks area, J. R. SNIPE and C. H. HAMMAR (*Missouri Sta. Bul.* 448 (1942), pp. 54, figs. 15).—The natural environment of the area and types of recreational facilities found in it and the utilization of the area for recreation are described and discussed. Analysis was made of some economic aspects of land use and recreation in the area, including the changes in the tax base, the importance of the Bagnell Dam and submerged land in the tax base, the valuation of recreational property, the recreational investment, and expenditures by groups stopping at commercial resorts by summer residents and by transient visitors. In 1928, when most of the real estate consisted of valley farms and their adjoining rough lands, the assessed valuation for the area included in this study was \$2,962,385, and the taxes levied were \$44,358. In 1939 the assessed valuation was \$9,073,065 and the taxes levied \$133,957. Of the total valuation 5.02 percent was commercial recreational real estate, 5.47 percent noncommercial recreational real estate, 6.73 percent undeveloped recreational land, 11.87 percent nonrecreational real estate, and 70.91 percent submerged land and the Bagnell Dam.

Farming new land in the Yazoo-Mississippi Delta: Problems of small, family-sized farms in the backwater area, P. S. McCOMAS, T. MULLINS, and E. L. LANGSFORD (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, F. M. 35, pp. [4]+46, figs. 3*).—This report, which deals with the Yazoo backwater area of the Yazoo-Mississippi Delta of Mississippi, "contains a description of the area and an analysis of its suitability for farming, a consideration of some of the problems confronting new-land settlers, and suggestions for improving the economic condition of new settlers. Major emphasis has been placed upon the operation of family-sized farms of which 5,000 to 6,000 can be developed in this new area."

Increasing incomes and conserving resources on cotton-corn farms in Marion County, Alabama, B. T. LANHAM, JR., and W. F. LAGBONE. (Coop. U. S. D. A.). (*Alabama Sta. Bul.* 256 (1942), pp. [2]+23, figs. 5).—The physical factors, farm trends, size of farms, and labor supply and requirements in the county are briefly described. Tables and charts are included and discussed showing for representative one-mule, two-mule, and three-mule farms the land use and crop production, livestock numbers and production, usual monthly distribution of man labor and mule work, cash receipts and expenses, summary of farm business and family labor returns, value of family living, etc., under the present farming system and under an alternate system with improved crop, livestock, and woodland practices and increased acreages in crops due to clearing woodlands and putting idle croplands into use.

Of the farms in the county, 3.3 percent had no mules, 32.3 operated with one mule, 45.6 with two mules, 10.7 with three mules, and 8.1 percent with over three mules. "One-mule units average 22 acres of cropland, two-mule units 35, and three-mule units 53. Most one- and two-mule units are worked by the operator and his family labor; whereas, most three-mule units are worked by the operator and his family plus the additional labor of one sharecropper family." "Net cash incomes (1935-39 prices and usual yields) for representative one-mule farms are \$102, and for representative two-mule farms \$176. The net cash incomes resulting from the alternative systems are \$186 and \$422, respectively, for the one- and two-mule farms."

Farm organization and financial returns in the lower Powder River Valley, Baker County, Oregon. G. B. DAVIS and D. C. MUMFORD. (Coop. U. S. D. A. et al.). (*Oregon Sta. Bul.* 406 (1942), pp. 56, figs. 10).—Data for the year ended May 31, 1939, were obtained during the summer of 1939 for 61 irrigated farms and ranches in the Keating area and for 19 dry-land farms in the Sparta area. The location, topography, soils, climate, economic development, etc., are described, and for each area analysis is made of the farm organization—type and size of farms, cropping system, livestock program, etc.—the distribution of investment, the receipts, expenses, labor income, credit situation, etc. For the Keating area the beef cattle, range sheep, dairy farm, and miscellaneous farm livestock practices are described in some detail, and the reasons for variations in income on the different types of farms are discussed.

[Effect of reorganization and price changes on farm income] (*Arkansas Sta. Bul.* 417 (1942), pp. 42-44, fig. 1).—The possibilities for obtaining increased returns from farms in the Coastal Plains area and in central and northern Arkansas through reorganization are briefly discussed.

Why some farmers are more successful than others, J. J. VERNON. (Coop. U. S. D. A.). (*Virginia Sta. Bul.* 341 (1942), pp. 19, figs. 7).—The important facts and conclusions in Technical Bulletin 71 (E. S. R., 86, p. 694), are presented.

A general appraisal of the livestock industry in the Southeastern States, W. K. McPHERSON (*Alabama Sta. Bul.* 257 (1942), pp. 32, figs. 14).—The trends from 1924 through 1939 in amounts of feeding stuffs and livestock products and in numbers of livestock on farms, the location of the livestock enterprises, and the possibilities of expanding the livestock industry in the area—Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, and Mississippi—are discussed. Charts show, for each State, the 10 States combined, and the United States, the indexes (1924-39) for production of all feeding stuffs, production of concentrate feeding stuffs, harvested forage feeding stuffs, pasture forage feeding stuffs, and major classes of livestock products, and amount of livestock on farms. Maps of the area show the total animal units, total feed units, number of swine, grain feed units, number of cattle, harvested forage feed units, and pasture feed units per square mile, and the number of feed units per animal unit, all by counties for 1940.

"Since farmers have been required to curtail the acreage planted to cotton, they have increased the production of feedstuffs. The most significant shifts have taken place in the States in which cotton is the major source of farm income and in Florida. . . . In the Southeastern States as a whole, increases in the production of harvested forage feedstuffs are greatest, followed closely by the production of concentrates during the period studied. The production of pasture forage did not increase significantly. . . . The production of livestock products has increased in all of the Southeastern States during the

period from 1925 through 1940. . . . Farmers in the cotton-producing States increased their livestock populations significantly during the past 10 yr. . . . Some increases in the production of livestock products can be expected as farmers learn and put into use better breeding and feeding practices, but any material increase in the production of livestock or livestock products in the Southeastern States will be dependent upon the ability of the farmers to increase the production of feedstuffs. Since most of the land suitable for cultivation is now being farmed, increases in the production of feedstuffs must, for the most part, come through an increase in the per-acre yields."

Forest grazing and beef cattle production in the Coastal Plain of North Carolina: Results of a survey of 100 cattle producing farms, H. H. BISWELL and J. E. FOSTER. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Bul.* 334 (1942), pp. 22, figs. 9).—One hundred farmers distributed throughout the area were interviewed by the authors, the specific objectives of the survey being to investigate the present use made of forest lands for grazing and the extent of the different forage types and the possibilities of expanding and improving the use of forest lands for grazing; the number, distribution, quality, and condition of beef cattle; the methods employed in feeding, breeding, handling, and marketing; the use made of tame pastures; and the chief problems in combining beef and timber production in this area. The material is presented under the following headings: Operators' plans regarding forest lands; extent to which forest lands are being used for grazing; forage types; browse and poisonous plants; forest fires; beef cattle—size of herds, breeding, management, condition, breeding season, feeding, and mineral deficiencies, diseases, and parasites; and tame pastures.

Forest lands and tame pastures each furnished about 29 percent of the year-long feed of beef cattle in the area. Ninety-two of the 100 farmers interviewed were grazing forest lands. The use of forest lands for grazing and the number of beef cattle have increased considerably in recent years, and there appears to be opportunity for greater expansion as many forest areas with nutritious native forage are not used at present. "The development of better practices and the proper correlation of the grazing of forest lands with that of tame pastures, field crops and feed, together with improved livestock and livestock management, afford a possibility of deriving greater returns from these lands than from the growing of timber alone."

Livestock and forestry enterprises on farms in the Ozark region, W. T. WILSON and J. W. REM (*Arkansas Sta. Bul.* 419 (1942), pp. 50, figs. 15).—Records for the crop year 1937 were obtained in May, June, and July 1938 by personal interview for 200 farms in the limestone region in north central Arkansas. "Data were collected for a relatively complete farm management analysis of the livestock and forestry enterprises, including farm organization, production methods and practices, receipts and expenses by enterprises, and other factors contributing to comparative success or failure." The region and the pasture, timberland, and crop management in the area are described.

The average size of farm was 294 acres, with 156 acres in forest land, 73 in open pasture, 48 in crops, and 17 acres in farmstead, waste, and idle land. The average number of livestock per farm was: Work stock 3.6, cattle 19.6, sheep 16.1, goats 11.8, hogs 13, and hens 57.2. The total investment was \$4,937 per farm. The average cash income for all farms was \$486, and the average net family income was \$895. Value of family living obtained from the farm averaged \$288. There was a tendency for incomes to increase as the size of farm increased. Acreage in timberland was an unimportant factor affecting income.

"When the farms were grouped by size, those with the higher percentage of land in pasture produced the higher labor income per farm up to the 400-acre group. As the number of animal units of all livestock increased, the labor income increased. Since cattle comprised about 57 percent of the total animal units, the effect of cattle on income was shown by the fact that the greater the number of cattle the higher the labor income. The principal factors for the success of the most profitable over the least profitable farms were: Larger total acreage, one and one-half times more livestock, higher crop yields, more legumes and pasture, 0.71 more returns from livestock and livestock products per animal unit, 2.15 more returns per acre of crops, and 6.47 more receipts per acre of forest land. The most profitable farms were organized for the production of livestock by balancing feed crops pasture, and livestock numbers."

Input-output relationships in milk production. E. JENSEN, J. W. KLEIN, E. RAUCHENSTEIN, T. E. WOODWARD, and R. H. SMITH (*U. S. Dept. Agr., Tech. Bul. 815 (1942), pp [2]+88, figs. 21*).—Two series of experiments were conducted at the Delaware, Indiana, Maryland, Michigan, Mississippi, New Jersey, New York State, Pennsylvania, South Dakota, and Virginia Experiment Stations. In the series I experiments, "cows were fed rations computed in what might be called the scientific way—strictly according to an accepted feeding standard, either the Haecker standard or the Morrison standard. All animals were fed maintenance rations according to their weight, but production rations varied from 30 percent below to 30 percent above the standard level. The differences in rates of feeding were designed to represent conditions where some herds continuously were fed more than the requirements called for per pound of milk in contrast to other herds that continuously were fed less than requirements. Therefore, if cows on the experiment in the heavy-fed groups responded to the feeding above standard requirements with increased production of milk, the production ration was increased." In the series II experiments, "the feeding as practiced by practical dairymen was approached more closely. Only one check group was fed according to the Haecker standard; the other groups were fed roughage at liberty, but the grain ration was varied in proportion to milk produced, so as to feed different groups 1:2, 1:3, 1:4, and 1:6 (1 lb. of grain for every 2 lb. of 4-percent milk, etc.). At two stations the cows in one group were fed only roughage. Except for some of the groups fed at standard the allowance of roughage was in no case curtailed, even if this meant that when cows were dry or giving only a small quantity of milk, they received more feed than was called for by the requirements of the feeding standard used. In this series some of the herds were barn-fed throughout the year; others were on pasture during the summer. Altogether, 157 yearly records were obtained of cows fed according to the series I method, and 210 according to the series II method."

In addition, five of the stations continued the work for a third year during which 87 cows were fed all the grain they would eat for most of the lactation period. "At four of the stations, the level of feeding was based on the Haecker standard; at the other six, on the ratio of grain to milk during lactation. At seven stations, these groups of cows were fed at six or more levels; at two stations, five levels; and at one station, two levels."

Some of the results and applications of the study were: "It was found that in the herds used for experiments, 15 to 20 percent more milk was obtained from the cows at high levels of feeding than from cows fed at standard, and 45 percent more than from cows fed at 70-80 percent of standard. The law of diminishing physical output applies to milk production. There was a consistent stepping up of production with every increase in grain allowance, but the additional milk produced for each additional unit of feed decreased. . . . The re-

sponse to increased feed was less at the high levels than at the low levels—0.6 lb. of 4-percent fat-corrected milk for each additional pound of digestible nutrients at the highest level and 1.7 lb. at the lowest level. At normal feeding levels the additional output for an additional unit of feed was much smaller than the average output per unit of feed consumed above maintenance. On an average, cows returned about 3 lb. of milk per pound of digestible nutrients consumed above maintenance; but for each additional pound of total digestible nutrient added to a normal ration an increase of only about 1.0-1.5 lb. of 4-percent milk was obtained. At low feeding levels this additional return was greater. At higher feeding levels it was even smaller. At two stations a group of cows fed roughage alone produced 80 percent as much as a comparable group fed grain at the rate of 1 lb. for each 6 lb. of milk in addition to all the roughage they would eat. . . .

"It is not possible by increased feeding to stimulate the milk production of cows of low inherent productivity as much as the production of cows of high inherent productivity. But it was found that at the same percentages of the standard production requirements, the low and high producing cows gave about the same additional amounts of milk for 1 additional pound of feed. With an increase in feeding level, cows reached a higher peak of production and maintained consistently higher production during the lactation period. . . . There was a fairly consistent increase in body weight as the feeding level increased. The difference in weight between cows fed at the lowest and highest levels was over 100 lb. . . . Feeding at different levels had no influence on the fat percentage of the milk. . . . The input-output relationships determined, if applied on a national scale, show that large additional quantities of feed grains can be converted into milk with only a small loss in efficiency. . . . The most profitable level of feeding is not fixed. It ranges all the way from no grain at all to more than 5,000 lb. of concentrates per year for cows capable of high production, depending upon prices of feed and milk. This means that the feeding standards may be profitably exceeded when the relationship between prices of feed and milk is favorable."

Seasonal variation in production in the New York milkshed, and its relation to production-adjustment plans, A. J. POLLARD. (Coop. U. S. D. A. et al.) ([*New York*] *Cornell Sta. Bul.* 783 (1942), pp. 62, figs. 8).—The purposes of this study were "first, to measure the differences in seasonal and in total deliveries of milk by various groups of producers in the New York milkshed, and in the butterfat content of milk delivered by these groups; and, second, to determine how the price returns to these different groups would be affected by certain modifications in the method of paying producers, designed to adjust the supply of milk either seasonally or annually." The analysis of the seasonal variations in production had for its purpose "to show, for a representative sample of dairies throughout the milkshed, (1) the relative number and monthly output of dairies having different patterns of seasonal production, and (2) the relationship between seasonality of deliveries and such factors as size of dairies, butterfat content of the milk, location in the milkshed, and market outlet." The study of production adjustments had for its purposes "to show how the price returns to producers with different patterns of seasonal production and in different locations in the milkshed vary under a market-wide pooling plan without a production-adjustment feature, and to show how these price returns would be affected by the use of any one of three types of production-adjustment plans."

Records of the quantity and butterfat content of milk delivered by 3,000 inspected dairies to 82 plants from July 1938 to June 1939 were analyzed. A sample of 229 uninspected dairies delivering milk to condensers and cheese factories was also obtained. The author summarizes the findings, in part, as follows:

"With respect to the seasonal variations of milk deliveries by dairies inspected for the New York market, this analysis has brought out the following points: A majority of the producers make their peak deliveries of milk in the second quarter of the year, but many producers make their largest deliveries at other times. Nearly half of the producers make their smallest deliveries of milk in the fourth quarter of the year. Most of the others make their smallest deliveries in either the first quarter or the third quarter. At all times of the year, the bulk of the milk supply for New York is contributed by producers whose largest deliveries are made in the spring and summer months. There are wide differences among the several districts of the milkshed as to the proportions of dairies with different patterns of seasonal production. In general, a relatively high proportion of the producers in the areas far from New York have uneven summer dairies (that is, their largest deliveries of milk are made in the second or the third quarter, their smallest deliveries are made in the first or the fourth quarter, and the ratio of the deliveries in their low quarter to the deliveries in their high quarter is less than 70 percent). In the areas near New York, a relatively high proportion of the producers have even or winter dairies (that is, the ratio of the deliveries in their low quarter to the deliveries in their high quarter is 70 percent or more, or their largest deliveries are made in the first or the fourth quarter and their smallest deliveries are made in the second or the third quarter). The proportions of even dairies and winter dairies appear to be somewhat higher among the members of large cooperatives than among the members of local cooperatives or the unorganized producers. There appears to be little, if any, relation of the size of dairies and the butterfat content of the milk to seasonal variations in milk deliveries.

"With respect to the analysis of the several payment plans studied, the following points have been noted: The variation in computed price returns to groups of producers with different seasonal patterns of production was surprisingly small under any of the plans for which analyses were made. The production-adjustment plans changed somewhat the annual returns to the various groups of producers, but the greatest change was only 4 percent. Application of the base-rating plan caused the greatest change in price returns. By modifying the base period, even greater effects on returns could be obtained. Each of the plans used in this study benefited the even producers whose largest deliveries were made in the third quarter of the year, and under three of the four forms of payment the summer producers received slight benefit. Each of the four forms of payment resulted in lower returns to the winter and spring producers."

Reducing truck mileage in retail milk delivery, J. A. HITCHCOCK (*Vermont Sta. Bul.* 491 (1942), pp. 12, figs. 3).—The findings are reported for a study in Burlington and Winooski, Vt., of the refrigeration facilities of stores and homes, the savings that would result from the delivery of milk only on alternate days, and the possibilities of consolidating milk delivery routes. Some of the findings were:

The average daily purchases of milk and weekly purchases of cream were 1.9 qt. and 0.65 pt., respectively, of which 18 and 32 percent, respectively, were purchased at stores. "Approximately nine-tenths of the storekeepers of the two cities, handling a little more than nine-tenths of the milk and cream sold through stores, stated that they had the facilities necessary to handle their receipts on an every-other-day delivery basis, though some indicated that such a scheme would be inconvenient." Seventy-five percent of the homes had mechanical refrigerators, 21 percent ice refrigerators, and 4 percent no refrigerators. "On the basis of a study of truck travel in a sample area it is estimated that at least four-fifths of the present truck mileage in house-door

delivery of milk is unnecessary. However, a complete consolidation of routes would require a very drastic reorganization of the milk distribution system, and probably could not be accomplished except by the establishment of a monopoly of the business in the hands of one agency."

Production credit in Florida citrus and vegetable areas, J. W. REITZ (*Florida Sta. Bul.* 367 (1942), pp. 102, figs. 3).—"This study is primarily concerned with borrowing operations of growers who obtained operating capital in the 1937-38 season, together with a consideration of the problems and policies of various agencies providing funds. . . . To obtain data for this study 1,000 citrus and vegetable growers were interviewed, 389 of whom borrowed for production purposes. Of 653 citrus growers interviewed 25.3 percent borrowed for production purposes as compared with 47.1 and 71.8 percent, respectively, for 102 citrus-truck and 245 truck growers. Records covering receipts, expenses, and borrowing operations as well as other information pertaining to the farm business were taken only from those growers and farmers who borrowed for production purposes during the 1937-38 crop season. Thus there are included in the study 165 citrus, 48 citrus-truck, and 176 truck records. Information on practices and policies were obtained from 151 lending agencies including commercial banks, production credit associations, shippers, brokers and commission firms, cooperative marketing associations, direct government agencies, and merchants." The sources of cash loans, the cost of such loans by source, the cost for secured and unsecured loans and according to term and size, the variation in terms by source of loans, security requirements, relation of equity in business to security requirements, life insurance as security, and budgeting and repayments of loans are discussed. The size and purpose of merchant loans, the cost of merchant credit, and secured merchant loans and their relation to term and cost are also discussed. Other subjects dealt with are installment credit, miscellaneous credit problems of growers, loans unpaid, lending operations of cash credit agencies and merchants, and credit practices and policies of merchants.

Some of the findings were: The 398 growers obtained \$917,193 in production loans, of which 72.1 percent was advanced by cash lending agencies. The average size of loan was \$1,815 and \$724, respectively, for cash lending agencies and merchants. "Citrus producers who borrowed obtained 40.5 percent of their cash expenses as compared to 48.6 percent for truck growers. Production credit associations furnished 35.2 percent, cooperative marketing associations, including the Growers Loan and Guaranty Company, 27.2 percent, banks 16.1 percent, and independent marketing agencies 14.3 percent of the cash credit obtained by 301 of the 389 growers who borrowed from cash sources. The remaining 7.2 percent was furnished by direct Government agencies." The average interest rate on cash loans was 5.3 percent, varying from 6.9 charged by banks to 5 percent charged by production credit associations. "When costs such as inspection and legal fees are included the effective interest rate on all loans was 5.9 percent. The effective rate for the Growers Loan and Guaranty Company was 7.2, banks 7.1, Florida Citrus Production Credit Association 6.6, local production credit associations 6.0, independent shippers 6.0, and cooperatives 5.4 percent." Approximately 75 percent of the cash loans were secured, but only 26.4 of the merchant loans. Eighty-three percent of the merchant credit was for fertilizers, 7.5 for seed, and 9.8 for spray and dust, grove care, and miscellaneous purposes. The effective interest rate was 22.8 percent on fertilizer loans and 7.7 percent on other types of merchant credit. Citrus growers obtained fertilizer credit at an effective rate of 13 percent as compared with 24.3 percent for truck growers.

Seventy-two of the 389 borrowers expressed dissatisfaction with the credit system. "Banks reported that 0.2 percent of their loans to growers were normally charged off. The respective figures for production credit associations, cooperatives, and independent shippers were 0.3, 1.3, and 5.0 percent." The normal losses on advances reported by different types of merchant firms were: Hardware and machinery 7.3, fertilizer 4.5, and general farm supplies 4.7 percent.

Use of credit by cotton farmers, Hardeman County, Tennessee, 1940. W. S. ROWAN and B. H. LUEBKE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 136 (1942), pp. III+34, figs. 35*).—"This study was undertaken to analyze the use of farm credit in cotton type-of-farming areas where the credit system has been geared to a one-crop system." Farm credit schedules were obtained from 51 farms. The area and the sample farms are described. The data are analyzed and discussed under the headings of amount and distribution of credit, real estate loans, and short-term credit—cash loans, merchant credit, open book accounts, and installment credit.

The average debt for farmers in the survey was \$570 per farm. One-third had no indebtedness, and nearly 50 percent no debt or less than \$100. The ratio of indebtedness to value of real estate, equipment, and livestock was 19 percent for the farms having indebtedness. Of credit, 75.6 percent was real estate mortgages, 14.9 chattel mortgages, 4.5 installment credit, 2.9 personal notes, and 2.1 percent open accounts. Nearly 62 percent of the real estate loans were incurred to buy farms. The average interest rates were: Real estate loans 4.7 percent, short-term cash loans 9.2, open accounts 11.5, and installment credit 12 percent on the original balance and 23 percent on the average unpaid balance.

Farm credit agencies in a cotton county, 1940. W. S. ROWAN and B. H. LUEBKE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 137 [1942], pp. III+19, figs. 8*).—"This second report on the study noted above discusses and analyzes the lending agencies operating in the county. The order of importance was commercial banks 32.4 percent, Federal land bank 31.5, individuals 15.8, Farm Security Administration 7.2, merchants 6, Production Credit Association 4.5, insurance companies 1.6, and emergency and crop loans 1 percent.

Estimation of income tax revenue and incidence. C. G. HILDRETH (*Iowa Sta. Res. Bul. 300 (1942), pp. 777-822, figs. 2*).—"This is an evaluation of a method of estimating the yields and incidence of various possible types of income tax—that of dividing the population into income brackets and estimating the number of people and average tax in each bracket.

Organization and operation of New Mexico cooperative cotton gin associations. R. P. CALLAWAY (*New Mexico Sta. Bul. 293 (1942), pp. 35, figs. 3*).—"The data upon which this study was based were obtained largely from the financial reports and records of these associations. The number and the location of cooperative gins, membership and number of patrons, volume of cotton ginned, etc., are described. Analysis is made of the sources of capital, capital investment, assets and liabilities, members' equities, and of operating results from 1938-39 to 1940-41. More detailed analysis is made for the 1940-41 season of the volume of business, sources of income, expenses of ginning, relation of volume ginned to net income from ginning, and distribution of earnings.

During the 1940-41 season 15 cooperative associations operated 18 of the active gins in the State and did nearly 60 percent of the total ginning. The average capital investment per association was over \$40,000. Members' equities for all the associations were 77 percent of the value of all assets. The net income of 8 identical associations, 1938-39 through 1940-41, averaged \$2.34 per 500-lb. bale, of which less than one-third was derived from ginning proper.

Patronage dividends averaged \$1.99 per bale, of which \$1.23 was paid in cash and 76 ct. credited to patronage equity accounts or issued as certificates. In 1940-41 nearly 40 percent of both the gross and net incomes came from the sale of cottonseed, 23 percent of the gross and 3 percent of the net income from bale cotton sales, and 18 percent of the gross and 32 percent of the net income from ginning and sterilization. The net income per \$1 of sales was for bale cotton 1.7 ct., cottonseed 12.4 ct., ginning 21.7 ct. per \$1 of revenue; handling bagging and ties 22 ct. per \$1 of sales and 31 ct. per pattern. Ginning expenses (13 associations) averaged \$3.21 per 500-lb. bale in 1940-41. Of the net income, 82.5 percent was used for patronage dividends, 9.5 percent credited to surplus, 5 percent for interest payments, and the remainder for dividends on stock, reserves, donations, and bad debts.

Cotton marketing practices in selected local markets in Louisiana, H. W. LITTLE and R. A. BALLINGER (*Louisiana Sta. Bul. 345* (1942), pp. 27, figs. 2).—Information related to the 1940-41 cotton marketing season was collected by personal interviews from 184 cotton growers and 52 cotton buyers in 8 markets in the northern and central parts of Louisiana. The average production of cotton per grower, the market outlets used by growers, the factors related to the choice of outlets, marketing practices of growers, their knowledge of quality and market conditions, and the practices of local cotton buyers are analyzed and discussed. Some of the findings and conclusions were that "30 percent of the producers had no knowledge of the quality of their cotton when they sold it and another 25 percent knew only what the buyer told them concerning the grade and staple length of their bales. . . . While nearly one-half of the producers had available current information concerning the price of futures and the spot prices of middling $1\frac{5}{16}$ -in. cotton, only 7 percent had access to information regarding premiums and discounts for various grades and staple lengths." Nearly 50 percent of the total volume of purchases in the local markets studied were made by independent buyers, over 40 percent by salaried buyers, and about 10 percent by persons buying on commission. "Practically all buyers at least made an attempt to determine the grade and staple length of a bale of cotton before purchasing it. However, it seems probable that a considerable proportion were not able to do this very accurately. About three out of every five local buyers interviewed had no means of checking their work against official grade standards or staple types. Most of the other buyers had access to the standards for only a few of the more common grades and staple lengths."

Marketing central Oregon and Klamath Basin late-crop potatoes, D. B. DELOACH and G. R. SUTTON (*Oregon Sta. Bul. 400* (1941), pp. 36, figs. 3).—"The purpose of the study was to determine the extent the marketing methods affected the quality of the product offered to the consumer and the manner in which the marketing methods influenced the character of consumer demand and the cost of marketing." Information was obtained by survey from 67 retail stores in the San Francisco Bay area, 65 in Portland, 25 in Eugene, and 17 in Salem, Oreg. A representative sample of each grade of Oregon potatoes handled by each store was graded by an inspector of the Oregon State Department of Agriculture. The production of and market for late potatoes are described. The San Francisco Bay area potato market, the markets of the three Oregon cities, and potato sales to governmental agencies are discussed, as well as the quality deterioration after shipping point inspection, the efforts to maintain quality, and marketing methods and marketing costs.

"Breakage, light greening, dry rot, and soft rot were found in a high percentage of the samples of potatoes taken in the several markets surveyed. A combina-

tion of these defects that developed after shipping point inspection was of sufficient importance to cause 65.1 percent of the samples from the San Francisco Bay markets to be below the grade designated on the original container. Comparable percentages for Portland, Salem, and Eugene were 47.6, 36.8, and 22.2, respectively. . . . The principal causes for deterioration in quality were rough handling that resulted in an excessive amount of broken and shattered potatoes, improper storage (temperature, air circulation, and stacking) that caused dry rot and soft rot, and improper display in the retail stores in which potatoes were exposed to light for too long a time that resulted in light greening. . . . The authors feel that, exclusive of waste from deterioration, the cost of marketing potatoes is not out of line with the cost of the services rendered by the dealers. Hand-to-mouth buying by the urban consumers has increased the costs of marketing by shifting risks and financing to the producer or to the middleman."

Operating practices on the farmers' section of the French Market in New Orleans, Louisiana, W. R. DANIEL and R. A. BALLINGER (*Louisiana Sta. Bul. 347 (1941), pp. 26, fig. 1*).—The use made of the market, the value of loads sold, time spent on the market by growers, types of buyers preferred, Government market reports and inspection service, truck-jobbers' sales on the market, the operations of buyers, etc., are discussed.

Analysis of the value of produce handled is made in tables showing the number of loads of different commodities offered on the market in 1939 and the percentages of each commodity coming from different districts. Some possible ways of improving the services of the market are suggested.

Nearly 85 percent of the 1,776 individuals qualified to sell on the market in 1939 operated farms in the 10 parishes surrounding New Orleans. The average area devoted to fruits and vegetables was 28.5 acres. The market was the sole outlet for fruits and vegetables for over 1,000 farmers, about 60 percent of the total number using the market. Less than 11 percent of the farmers sold as much as 50 percent of their produce elsewhere.

The Baton Rouge City Abattoir: Relation to the retail meat supply, production and marketing problems of farmers, J. M. BAKER (*Louisiana Sta. Bul. 351 (1942), pp. 20, fig. 1*).—The purpose of this bulletin "is to ascertain the extent to which the Baton Rouge abattoir has achieved the objectives for which it was established, to show its relation to the retail meat supply and to the local livestock industry, to give information which would help to determine whether the plant should be continued in operation, and to show the advantage of uniting the operation of the abattoir with other marketing units needed by the farmers. . . . Information was obtained from 46 local meat dealers concerning the sources of their meat supply and their opinions of the value of the Baton Rouge City Abattoir to the meat trade, the farmer, and the consumer. . . . Data concerning the operation of the city abattoir were obtained from the manager of the abattoir and from records on file at the city hall. Personal interviews with managers of abattoirs and with local meat dealers were used as a means of obtaining information from them." The volume and kinds of livestock slaughtered, the cash earnings and expenses, amount and sources of the earnings and the operating costs, the use of the abattoir by retail meat dealers, the sanitary condition, and the need for the abattoir and of a cooperative or quasi-cooperative farmers' market, with a number of activities, including the city abattoir, are discussed.

Cooperative manufacture and distribution of fertilizer by small regional dry-mix plants, J. H. LISTER (*U. S. Dept. Agr., Farm Credit Admin. Cir. 126 (1941), pp. [4]+102, figs. 10*).—The rise, present development, and methods of

operation of the Farmers' Cooperative Fertilizer Purchasers, Inc., Kenbridge, Va., the Tennessee Valley Fertilizer Cooperative, Decatur, Ala., and the Central Farmers' Cooperative, Inc., Selma, Ala., are discussed. Analysis is made for each of the sales, costs of materials, operating expenses, gross operating income, departmental operations, unit costs of operation, distribution of income, and financial condition. Appendixes include the articles of incorporation and bylaws of the three associations.

"These three regional-type associations have provided an economical fertilizer service for their members by making available at reasonable cost fertilizer of good quality adapted to the needs of the areas served."

Corn futures: Volume of trading, open contracts, and prices from January 2, 1936, to December 30, 1939 (*U. S. Dept. Agr., Statist. Bul. 74* (1941), pp. 151, fig. 1).—This bulletin is the fourth (E. S. R., 77, p. 718) presenting corn futures data on volumes of trading, open contracts, and prices published by the Commodity Exchange Administration, formerly the Grain Futures Administration. "All statistical data presented in this bulletin on volume of trading and open contracts have been compiled from reports furnished the Commodity Exchange Administration by the clearing members and the clearing associations of the exchanges. The price data are from the official quotations of the Chicago Board of Trade for transactions in 'round lots' of 5,000 bu. or multiples thereof. In a few instances these quotations have been supplemented by data secured from brokerage houses."

World corn production and trade, H. H. CONRAD (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr. Rpt. 5* (1942), pp. [2]+49, figs. 19).—This review of world corn production and trade covers the period 1925-39 and is limited as far as possible to corn as a grain. Statistics are presented and discussed on world production and trade. The position that corn occupies in the economy, before the outbreak of World War II, of the countries in North America, South America, Europe, Africa, Asia, and Oceania is described and discussed.

"During the first 5 yr. of the period the United States accounted for about 55 percent of the total world outturn, but during 1935-39 the combined production of the other countries averaged slightly above the United States crop. International trading in corn was considerably stimulated during the period, particularly in Asiatic countries. Exports from Indo-China and Manchuria were expanded, and Japan became an increasingly important import market. The increased world demand for corn resulted largely from its high value as livestock feed, but the utilization of this grain for human food accounted for a sizable share of the world consumption, especially by native farmers of Africa, South America, and Asia. Furthermore, in the latter part of the period the mixing of corn flour with wheat flour was required in several countries as a means of stretching wheat supplies."

"New World" wheat agreement, G. P. BOALS (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 2* (1942), No. 8, pp. 148-150, figs. 2).—A brief statement of some of the provisions of the agreements signed by Argentina, Canada, the United States, Australia, and Great Britain and announced July 2, 1942.

Foreign Agriculture, [June-September 1942] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 6* (1942), Nos. 6, pp. [2]+209-253, figs. 15; 7, pp. [2]+255-298, figs. 5; 8, pp. [2]+299-320; 9, pp. [2]+321-342).—Included are articles as follows: No. 6, British Food Administration, by M. Ogdon (pp. 209-226) (see p. 130), and Venezuela's Agricultural Problem, by K. H. Wylie (pp. 227-253); No. 7, North Caucasus—A Russian Granary, by L. Volin (pp. 255-264); The Food Supply of India, by W. I. Ladejinsky, (pp. 265-281),

United States-Peruvian Reciprocal Trade Agreement, by L. C. Nolan (pp. 282-294), and Wartime Farm Labor Supply in the United Kingdom, by M. E. Long (pp. 295-298); No. 8, Continental Europe's Prewar Food Balance, by J. H. Richter (pp. 299-312), and Yerba Matè, by L. C. Nolan and J. L. Wooster (pp. 313-319); and No. 9, International Agreements for the Control of Farm Surpluses, by L. A. Wheeler (pp. 321-325), Wartime Distribution of Agricultural Machinery in the United Kingdom, by M. E. Long (pp. 326-328), and Australian Wheat Stabilization, by M. E. Wright (pp. 329-339). Notes are included on pages 340-341 on The International Wheat Agreement, United States and Canada Collaborate in Harvest Work, and The Second Inter-American Conference of Agriculture.

Crops and Markets, [May and July 1942] (*U. S. Dept. Agr., Crops and Markets*, 19 (1942), Nos. 5, pp. 105-128, figs. 2; 6, pp. 129-164, figs. 2).—Each number includes general crop reports, reports on specific crops, reports of farm labor wages, prices received by farmers for farm products, stocks of grains on farms, etc., and market reports for cotton, dairy and poultry products, feed, grain, and livestock and livestock products.

Prices of farm products in Iowa, 1851-1940, N. V. STRAND (*Iowa Sta. Res. Bul.* 303 (1942), pp. 905-998, figs. 26).—This is a local farm price series for Iowa, beginning with 1850.

RURAL SOCIOLOGY

Statistics of family composition in selected areas of the United States, 1934-36.—X, Los Angeles, California (*Fed. Security Agency, Social Security Bd., Bur. Res. and Statis. Mem.* 45 (1942), pp. XXVIII+308).—Data are presented from the study of family composition in the United States, based on the National Health Survey, made in 1935-36 by the United States Public Health Service.

The rural population resources of Missouri, C. E. LIVELY and R. B. ALMACK (*Missouri Sta. Bul.* 444 (1942), p. 75).—In this study the authors found that the State of Missouri could use little more than half of the farm-reared males in the occupation of farming without increasing the number of farms and farmers. The proportion varied from two-thirds in the northwestern section to two-fifths in the Ozark area.

Adjustment of population to rural resources in Missouri, C. E. LIVELY. (Univ. Mo.). (*Jour. Land and Pub. Util. Econ.*, 18 (1942), No. 1, pp. 67-76, figs. 2).—The author discusses the relationship of population and land in the State. Included are trends in population growth, population fertility in relation to growth, population movements, rural resources, migratory labor, and the relation of health to population.

Beaverdam: A rural community in transition, A. D. EDWARDS (*Virginia Sta. Bul.* 340 (1942), pp. 64, figs. 12).—This report describes a rural community in central Virginia. Some topics presented are the economic base of the community and population trends and living conditions in the community. Also discussed are community organization, changing functions of local government, and the role of Negroes in the life of the community.

Comparison of representation in administrative agencies with natural neighborhoods and communities, Roane County, Tenn., C. E. ALLRED, H. J. BONSER, and L. S. STITH (*Tennessee Sta., Agr. Econ. and Rural Sociol., Dept. Monog.* 138 (1942), pp. [3]+47, figs. 29).—This is an analysis of 52 white and 2 Negro natural neighborhoods in the county.

"Members of committees and boards and the county officials are concentrated in the towns. Agricultural representation is unequally distributed. . . . Women would be expected to furnish a more important share of the leadership and

representation in the county. There is a concentration of representatives along the highways and at other accessible locations."

Reorganization of public welfare in Michigan, E. B. HARPER and D. L. GIBSON (*Michigan Sta. Spec. Bul.* 318 (1942), pp. [1]+80, figs. 5).—This is a study of a major local institution, public poor relief, in the process of adjusting to changed conditions. The investigation centered around four sample counties shortly before reorganization took place and was aimed at discovering the condition factors as well as the nature and degree of the adjustment that actually occurred.

By way of practical application of the findings, it is concluded that welfare reorganization in Michigan must be viewed as a continuous process, to be effective must be based upon public opinion in the local community, and, finally, where the emergence of new problems and conditions and the demands for efficiency indicate the need for change, must be preceded by community re-education. Efforts at intellectual instruction should be directed particularly at changing emotional beliefs and popular ideas and at demonstrating the relation of the new program to obvious local needs and accepted values. In addition it should be aimed specifically at rural elements in the population and based on a thorough knowledge of rural social psychology and customs.

Zoning land for recreation, G. S. WEHRWEIN and H. A. JOHNSON. (Univ. Wis.). (*Jour. Land and Pub. Util. Econ.*, 18 (1942), No. 1, pp. 47-57).—This is a stock taking of 10 yr. of the recreational use of land in Oneida County, Wis.

Parent-adolescent adjustment, its measurement and significance, L. H. STORR. (Nebr. Expt. Sta.). (*Character and Personality*, 10 (1941), No. 2, pp. 140-150).—In an extension of the author's study (E. S. R., 85, p. 267), a new family life questionnaire of 150 items was constructed with particular reference to such matters as the degree of mutual confidence between the parents and their adolescent children, the amount of family cooperation and joint activity, and the extent of good fellowship, congeniality, and companionship within the family group. This questionnaire, which could be answered in terms of three responses—F (frequently), O (occasionally), and R (rarely or never)—together with other scales and questionnaires, was administered to 490 young people between 13 and 20 yr. of age, with a mean of 15.4 yr., and about evenly divided as to sex, living on farms and in small farm communities in a single county in the State and attending small community high schools. The methods used in the analysis of the material are described, with a discussion of the significance and interpretation of the findings.

"The significance of this study lies in its emphasis on the importance of the individual parent-child relationship. It stresses the fact that every child in the family occupies a unique position and assumes a unique role in family interaction, and that slight original differences in temperament or motivation soon become important differences, as roles are assumed and practiced in the daily contacts of family and social life. Because of these differences, the same general family situation might constitute very different effective environments to different children in the family. Hence, it is quite important that the parent make a study of, and gain insight into the unique individual problem of each child, if he is to be successful in achieving happy and helpful relationships with all his children."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Supervised practice in vocational agriculture in Iowa, H. P. SWEANY and J. A. STARRAK (*Iowa Sta. Bul.* P29, n. ser. (1941), pp. 32, figs. 3).—"This bulletin presents the findings of an investigation, the major purposes of which were

(1) to identify the chief factors which apparently contribute to the success of the more effective programs of supervised farm practice now in existence in Iowa, and (2) to ascertain the methods employed by the instructors in the development and maintenance of their programs. Twenty-four of the 128 high schools in Iowa offering courses in vocational agriculture during the school year 1937-38 were selected because of the relatively high quality of their supervised farming programs. The specific technics employed by the instructors in these selected schools in the organization and supervision of the respective supervised farm-practice programs were investigated in considerable detail."

Some of the more important findings were: "Three of the four commonly recognized types of supervised farming practice are represented in the programs of the 24 departments investigated, i. e., the productive enterprise project, the improvement project, and the supplementary farm practice. The fourth type, placement for farm experience, is apparently nonexistent in these programs." Of the 17 objectives of supervised farming programs scored by teachers, the 5 receiving the highest scores were "to establish boys in farming, to improve farming methods used on the individual home farm and in the community as a whole, to develop an interest in farming as an occupation, to provide a means of earning for the boys, to develop methods of economical production."

Parents were the greatest single source of financial aid in establishing the projects, and intelligent cooperation of parents was considered an important factor in the success of the programs. Twenty-three of the 24 departments included in the investigation had Future Farmer chapters. Only 51 percent of the boys had complete control over the management of their projects. Long-time planning of the program is essential if the objective "establishment in farming" is to be realized. Instructors made frequent use of class time and activities in planning and promoting the programs of their students. "The purposes for which the instructors most frequently visited the boys on their home farms were as follows: (1) To encourage the boy and increase his interest, (2) to teach some important principle or technic, (3) to assist with the discovery and solution of problems encountered, and (4) to check upon methods being used in the projects. The practices most frequently employed by instructors to develop and maintain interest in supervised farming programs were as follows: (1) Project tours, (2) showing at fairs, (3) promotion through ranks of Future Farmer chapters, (4) news items in local papers." Considerable cooperation in marketing products and buying seed and breeding stock and also in their production were reported.

Farm market outlets for home industries (*Arkansas Sta. Bul.* 417 (1942), pp. 13-14).—A brief report of a study by I. C. Wilson on reasons for success or failure of home demonstration club, farmers' curb, and handicraft markets in the State.

The impact of war on experiment station research in home economics, S. L. SMITH. (U. S. D. A.). (*Jour. Home Econ.*, 34 (1942), No. 7, pp. 447-453).—A paper presented before the research department of the American Home Economics Association at its 1942 convention.

Introduction to meteorology, S. PETTERSSSEN (*New York and London: McGraw-Hill Book Co.*, 1941, pp. IX+236, figs. 142).—Intended for students without previous acquaintance with the subject, this text was written in response to a demand for a nontechnical book to serve the many short and elementary courses in meteorology already in progress in the United States.

Plant biology, P. WEATHERWAX (*Philadelphia and London: W. B. Saunders Co.*, 1942, pp. VI+455, figs. 182).—This book has been prepared in an attempt to present a college course providing the cultural values expected of an intro-

duction to a science and at the same time serving as a satisfactory groundwork for more technical advanced courses in botany.

FOODS—HUMAN NUTRITION

[Foods and nutrition research by the Texas Station] (*Texas Sta. Rpt. 1941*, pp. 24-25, 85-87).—This is a progress report (E. S. R., 86, p. 267) of studies, some of which have been noted elsewhere, on variations in the vitamin content of foods, by G. S. Fraps, W. W. Meinke, and A. R. Kemmerer; the chemical and physical factors responsible for tendering meat during cooking, by S. Cover; processing of canned meat, by Cover, H. Schmidt, and R. D. Turk; and the mineral composition of vegetables grown in representative regions of Texas and the relation of variation in mineral content to the probable nutritive value, by J. Whitacre [et al.] (Coop. U. S. D. A. et al.).

The forty-sixth report on food products and the thirty-fourth report on drug products, 1941, E. M. BAILEY ET AL. (*Connecticut [New Haven] Sta. Bul. 460 (1942)*, pp. 423-456).—This annual report (E. S. R., 86, p. 550), summarizing the results of regulatory examinations for the calendar year 1941, includes data on the lead content of milk, the ascorbic acid content of rose hips (0.17 mg. per gram for *Rosa multiflora*; 1.4-6.0 mg. per gram for *R. rugosa*), and an abstract of a paper by H. J. Fisher on Sugar and Its Substitutes.

[Meat studies of the Missouri Station] (*Missouri Sta. Bul. 444 (1942)*, p. 63).—This progress report (E. S. R., 83, p. 269) for the year ended June 30, 1939, includes studies by J. A. Cline, M. C. Hayes, and R. Staggs on the relation of U. S. grades of beef to the palatability of porterhouse steaks and the effect of constant oven temperatures upon the palatability and cooking losses of commercially cured hams.

Digestion characteristics of various types of milk compared with human milk, F. J. DOAN and J. L. DIZIKES (*Pennsylvania Sta. Bul. 428 (1942)*, pp. [1]+18, figs. 5).—The curd characteristics and digestibility of different types of milk were determined by an in vitro method based on that of Doan and Flora (E. S. R., 81, p. 736), but modified (1) to eliminate the tryptic digestion, (2) to provide for carrying out the digestion with artificial gastric juice in thin-walled rubber tubes subjected to a definite rhythmic squeezing action simulating peristalsis, and (3) to provide for gradual lowering of the pH during the digestion period to conform with what is known to occur in the infant stomach. The various curd-size fractions present in the milk at zero digestion time and after the first, second, and third hour of digestion were hardened to prevent breakup by treatment with formaldehyde and were then separated by a series of screens and a filter paper. The amounts of the various sized curds were determined, not by weighing, since this was shown to introduce errors due to variable protein hydration, but by nitrogen determination. The procedure is described in detail, and the digestion apparatus is described and illustrated. The results of digestibility analyses on a number of different types of milk are presented as a bar graph which makes it possible to visualize the curd characteristics and progressive changes during digestion and to compare one type of milk with another, as well as with breast milk utilized as a standard of comparison. Lactic acid milk or buttermilk (pH 4.5 or lower), evaporated milk, and superheated soft-curd milk were found to exhibit excellent digestibility characteristics and are considered particularly suitable for artificial feeding of infants. Next to these and in descending order of suitability for infant use were lactic acid milk (pH 5.4-5.7), boiled milk, homogenized milk, metaphosphate-treated milk, chocolate milk, trypsin-treated milk, and goat's

milk, the last four being only slightly more digestible than ordinary milk. Milk treated with locust bean gum was detrimentally affected.

More milk for more children (*U. S. Dept. Agr., Misc. Pub. 493 (1942), pp. 8, figs. 9*).—An informational publication regarding the purpose, operation, the requirements, etc., of the school milk program of the Agricultural Marketing Administration.

Butter and margarine, R. M. LEVERTON. (*Univ. Nebr.*). (*Jour. Home Econ.*, 34 (1942), No. 4, pp. 240-241).—Food value for the money expended (in the present illustration 25 ct.) is calculated for butter, fortified margarine, and other foods. At the prices listed and as far as vitamin A is concerned, it is pointed out that green, thin-leaved vegetables, such as chard, and yellow vegetables, such as carrots, are more economical sources of vitamin A than either butter or margarine, and that the two latter may be equally economical, depending on their relative vitamin A potency and their relative cost.

Wheat in national diets, M. K. BENNETT (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 18 (1941), No. 2, pp. 35-76, figs. 6*).—This study presents a statistical investigation of the place of wheat in the national diet of 52 nations (1933-38) and changes in the position of wheat between 1923-28 and 1933-38. The population of the 52 nations constituted some 88 percent of the world total in 1935. Calories from cereals and potatoes constituted as little as 30 percent of the total food calories in some countries and as much as 90 percent in others. The relative importance of this group of foods was largely determined by income status so that the ratio of cereal-potato calories to total food calories was in itself a rough index of income status and a rougher index of quality of diet. Wheat contributed less than 5 percent of the total food calories in several countries, mostly oriental or tropical, and as much as from 40 to 50 percent in others. In the United States and some 17 other countries, wheat dominated among the cereal-potato foods, furnishing over half—even up to 75 percent in some nations, including the United States—of the cereal-potato calories. In other countries rice, rye, or corn was dominant. The interrelated factors of climate, food preference, and income status seemed to explain these preferences. Changes in national per capita disappearance of wheat flour from 1923-38 to 1933-38 were in some instances of large magnitude and usually difficult to explain. They did not tend toward equalization of divergent levels.

Why enrichment of flour? A. E. TAYLOR (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 18 (1941), No. 3, pp. 75-108, fig. 1*).—This paper "is devoted to a discussion of the background of the problem of enrichment or fortification of foods with vitamins and minerals and the reasons which have prompted our Government to take a formal step in enrichment of wheat flour by permitting the addition of specified amounts of thiamin, nicotinic acid, riboflavin, and iron."

Milk solids and enrichment—an experimental enquiry, H. H. MITCHELL, T. S. HAMILTON, and J. B. SHIELDS. (*Univ. Ill.*). (*Bakers Digest*, 16 (1942), No. 9, pp. 185-186, 199, figs. 3; also essentially in *Milk Plant Mo.*, 31 (1942), No. 6, pp. 24-29, figs. 3).—This address gives the findings of a biological comparison of nine breads, each fed as the sole diet except for a supplement of cod-liver oil, to young growing rats that were observed for growth response and analyzed to determine their storage of minerals and vitamins. The breads, prepared according to specifications, were designed to compare the nutritive quality of milk breads (white bread, enriched white bread, and whole-wheat bread, each made with 6 percent milk solids) with the nutritive quality of enriched white bread and whole-wheat bread.

"The presence of milk solids in the bread formula, or of added calcium salts, brought about a more complete calcification of the bones. Milk solids in bread, as compared to enriched bread, induced a greater store of riboflavin in the body.

Whole-wheat bread behaved similarly. Milk solids, although contributing very little niacin to a bread formula, seemed to improve the retention within the animal body of niacin added as such to the bread. Although containing more iron than unenriched milk-solids bread, neither enriched bread nor whole-wheat bread induced a greater concentration of hemoglobin in blood. The thiamin content of rats raised on unenriched milk-solids bread was distinctly less than that of rats raised on whole-wheat or enriched breads." It is concluded that the best breads contain both the enriching elements and milk solids.

Home canning of fruits, vegetables, and meats, L. STANLEY, M. STEINBARGER, and D. SHANK (*U. S. Dept. Agr., Farmer's Bul. 1762, rev. (1942), pp. [2]+48*).—This revision of the publication noted previously (*E. S. R.*, 76, p. 419) is directed toward meeting the limitations imposed by present restrictions of supplies. Specifically it advises that pressure canners be shared, notes the war-time types of glass jars and bottles available, emphasizes the need for using jars on hand and for reusing screw bands, and outlines adaptations toward adjusting to the sugar allowance under the rationing system. In the latter case it is suggested that fruits be canned in their own juice or in thin or medium sirup or even in water. It is pointed out that honey may be used to replace up to one-half and corn sirup up to one-third of the sugar called for in canning.

The use of calcium chloride in the home canning of whole tomatoes, Z. I. KERTESZ (*New York State Sta. Cir. 195 (1942), pp. 3, fig. 1*).—Since recent tests (*E. S. R.*, 83, p. 302) have shown that this treatment causes a much better retention of the firmness and shape of the tomatoes, the application of this procedure to the home canning of tomatoes is recommended, particularly late in the season when the tomatoes mature and soften and tend to fall apart during processing. In the procedure described whole tomatoes are prepared for canning in the usual manner and placed in quart jars. Before the tomato juice is added to the jar, 1 teaspoonful of a CaCl_2 solution containing $2\frac{1}{4}$ oz. of anhydrous CaCl_2 in 1 pt. of water is added. The jar is then filled with tomato juice and processed. This amount of CaCl_2 , about 10 gr. per quart jar, approximates the proportion (0.07 percent) permitted under the food laws if declared. When the process is used with small Italian-type tomatoes which are just ripe, the tomatoes usually retain enough of their firmness to be used in winter salads.

Canning with a pressure cooker, H. CHARLEY and R. D. NOERS (*West Virginia Sta. Cir. WS 7 (1942), pp. [8], fig. 1*).—This nontechnical leaflet for housewives describes pressure cookers of different types and gives general directions for their use, with a time table and specific directions for canning several nonacid foods.

Home preparation and preservation of fruit and vegetable juices, D. K. TRESSLER and C. S. PEDERSON (*New York State Sta. Cir. 194 (1942), pp. 20, figs. 9*).—Two types of juices are considered, namely, cloudy or natural juice prepared by pressing the ground or crushed fruit in coarse cloths, and pulpy juice prepared by forcing pulp and juice of the fruit through a corrosion-resistant metal screen. For preparing the cloudy juice, three types of presses are described and illustrated, these being (1) the screw (barrel) press available in several sizes, (2) the nutcracker type press for small quantities, and (3) a press utilizing an ordinary hydraulic automobile jack and other materials usually available on the farm. Construction details and dimensions are given for the latter press, with approximate capacity of 1 bu. of fruit. For preparation of pulpy juice the tapered press or extractor, electrically or hand-operated, and the centrifugal extractor are described. The latter press serves for making small amounts of juice for immediate consumption from the more solid vegetables and fruits. The general principles of preparation, including hot or cold

extraction, and of preservation by freezing or heat sterilization (pasteurization) are discussed. Particular emphasis is given to the necessity for rapid and prompt handling through all procedures. Detailed directions are given for making and preserving apple, grape, cherry, raspberry, plum, and blended-fruit juices; and tomato juice (and blends), sauerkraut, rhubarb, carrot, celery, beet, and turnip juices.

Drying foods for victory meals (*U. S. Dept. Agr., Farmer's Bul. 1918 (1942), pp. 11+14, figs. 3*).—This publication, bringing together information to date on methods for home drying of fruits and vegetables, stresses the importance of this method of preservation as a wartime measure for conserving sugar, metals, rubber, and other materials. Consideration is given to the importance of speed in the process, the kinds of fruits and vegetables to dry, general directions concerning preparation for drying, equipment for steaming, methods of drying, containers and conditions for storage, and preparation for table use. Specific instructions on how to dry individual foods are given for 10 fruits and 13 vegetables.

Food from the garden, H. V. TAYLOR, J. C. DRUMMOND, and M. PYKE (*Nature [London], 148 (1941), No. 3763, pp. 712-714*).—This report is based on records for 1940 of crop yields obtained by seasons from 98 vegetable gardens planted according to the cropping scheme issued by the Ministry of Agriculture (Great Britain) in 1939. Quantities of vitamins A and C furnished by these crops were estimated by seasons. A fairly even supply of vegetables was secured, with the larger quantities available during the winter months. It appeared probable that the vitamin C requirement and a substantial proportion of the needs for vitamin A for a family of five would be supplied throughout the year with crop yields such as those obtained in the present test of the cropping scheme.

Food investigations in Canada (*Nature [London], 149 (1942), No. 3766, pp. 27-28*).—This is a summary of the research program at the food laboratories of the National Research Council of Canada as affected by the war. Brief progress reports are included on poultry, eggs, pork, and bacon.

British Food Administration, M. OGDON (*U. S. Dept. Agr., Foreign Agr. Relat., Foreign Agr., 6 (1942), No. 6, pp. 209-226*).—This report discusses the functions and organization of the Ministry of Food, Great Britain, and the decentralization of some of its activities by the formation of divisional food offices; acquisition and control of supplies, including control of agricultural production and supplies, commodity marketing schemes for milk control and for the control of the oil and fat industry; consumer price control; developments in method of food rationing, including points rationing scheme, differential rationing for heavy workers, consumer supplies in air raids, social aspects of rationing, and education and enforcement. Numerous references are given as footnotes and literature citations.

Biological symposia, VII, edited by J. CATTELL (*Lancaster, Pa.: Jaques Cattell Press, 1942, vol. 7, pp. VIII+322, pl. 1, figs. [84]*).—This symposium (edited by H. Klüver) deals with Visual Mechanisms. The sections on The Photochemistry of Visual Purple, by A. C. Krause (pp. 23-41); Visual Systems and the Vitamins A, by G. Wald (pp. 43-71); and Anoxia in Relation to the Visual System, by E. Gellhorn (pp. 73-85) (Univ. Ill.) are of particular interest.

Nutrition in national defense, F. G. BOUDREAU (*Amer. Jour. Pub. Health, 31 (1941), No. 9, pp. 977-983*).—This is a summary of the papers and discussion of the round table on nutrition in national defense at the 1941 conference of the Milbank Memorial Fund.

The selection of foods for between-meal feeding in industry, H. H. HAGGARD and L. A. GREENBERG (*Jour. Amer. Dietet. Assoc., 17 (1941), No. 8, pp.*

753-758).—Earlier recommendations of the authors that food for between-meal feeding in industry need fulfill only two requirements—(1) that it supply carbohydrate (not less than 30 mg.) and (2) that it put no burden on digestion—have been supplemented by a third requirement—(3) that it contain both minerals and vitamins. Canned natural fruit juices are considered to fulfill these requirements and to have the advantage of being easily served in the factory. To determine the relative values of different fruit juices in raising the blood sugar, six adult male subjects were given 225 cc. of the fruit juice in question. The concentration of sugar in the blood was determined at half-hour intervals for 4 hr. Three series of determinations were made on each of the six subjects. The average basal concentration was 96 mg. percent, and the average increase above this level for the different fruit juices amounted to 81 mg. percent for pineapple juice, 53 for unsweetened orange juice, 76 for sweetened orange juice, 49 for unsweetened grapefruit juice, 72 for sweetened grapefruit juice, and only 22 mg. percent for tomato juice. In comparison, the increase in blood sugar following the ingestion of 30 gm. of dextrose in 225 cc. of water was 88 mg. percent.

Nutrition in relation to pregnancy and lactation, J. E. BECKER, H. J. BICKERSTAFF, and N. J. EASTMAN (*Amer. Jour. Pub. Health*, 31 (1941), No. 12, pp. 1263-1270).—In this paper, presented at the 1941 meeting of the American Public Health Association, the authors consider in some detail the daily allowances for specific nutrients during the latter half of pregnancy and lactation adopted by the committee on food and nutrition of the National Research Council and review the literature on which these allowances were presumably based. The need for sound dietary advice and practices throughout these periods is emphasized, with the comment that "the taking of a detailed dietary history several times during pregnancy, followed by suggestions and help in the making of necessary changes, would seem as important a procedure in the management of pregnancy as the physical examination and medical history."

Hospital diets (*War Dept. [U. S.], Tech. Man. No. 8-500, pp. 309*).—This manual, prepared in the interest of standardizing the construction of menus and the preparation of diets in military hospitals, is intended to simplify the problems of ordering and preparing diets suitable for average patients under normal conditions and for specific cases. The diets, designed to meet the normal requirements of station or hospital, are compiled from various sources. No attempt is made to discuss diets in detail. The several chapters deal with the normal diet and its modifications; therapeutic and special diets; instruction pamphlet data for patients; and menus. The appendix presents tables on food composition, weights and measures, liver recipes, and recipes for diabetics.

Anthropometric and orthopedic examinations: A technique for use with children, M. P. BAUM and V. S. VICKERS (*Child Develpmt.*, 12 (1941), No. 4, pp. 339-345).—The methods followed in the department of child hygiene of the Harvard School of Public Health in taking body measurements and in making observations of posture of infants and children are described, with emphasis on the recognition and handling of the psychological problems of children. These are discussed in four age groups—young infants, older infants from 15 to 24 mo., children from 2 yr. to those in the third or fourth grade of school, and older children. The order in which body measurements are taken is listed, and the measurements included are described briefly.

Mass studies in human nutrition: Nutritional status of children in a college community, P. B. MACK, J. M. SMITH, C. H. LOGAN, A. T. O'BRIEN, A. H. STEWART, and P. DODDS. (*Pa. State Col. et al.*). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 2, pp. 69-78, figs. 24).—The results of a study by the methods described previously (E. S. R., 82, p. 130) of the nutritional status of a group of 147 intermediate grade school children in a college community were compared

with those of a group of children of the same age in a small industrial city (E. S. R., 86, p. 858). As judged by physical examination, 20 percent of the children in the college community fell in the highest class as compared with none in the industrial community, 77.2 as compared with 30.8 percent in class 2, and 2.8 percent in class 3, and none in classes 4 and 5 as compared with 69.2 percent for the three lower classes combined. Similar differences, though varying in degree, were found in the results for the separate tests for various aspects of nutritional status. In weekly intakes of various foods by all income classes combined, the corresponding values for the college and industrial groups, respectively, were milk 4.2 and 2.8 qt., meat 8.9 and 3.3 servings, eggs 2.9 and 2.3 in addition to those used in cooking, citrus fruits 4.9 and 2.6 servings, other fruits 7.9 and 4.9, potatoes 6.9 and 5, green vegetables 4.9 and 4.1, yellow vegetables 2.8 and 1.7, and tomatoes 3.8 and 2.2 servings, and bread 27.3 and 48.3 slices, respectively. Comparing the food intakes of the same income groups, "there was a higher intake of these foods throughout all income groups of the college community which was believed to be associated with the greater community attention to nutrition problems in the former community. Even in this community, however, all children were not in optimum nutritional well-being, showing that even among more privileged families there is still room for improvement in the feeding of growing children."

An assessment of the nutrition of a rural population in Tennessee, J. B. YOUMANS (*Amer. Jour. Pub. Health*, 31 (1941), No. 7, pp. 704-708).—In the present investigation records of food consumption are obtained by field workers on a family and individual basis, using a week's inventory record for the family and three daily records per week for each individual. The assessment of the physical condition is based on a full medical history, a complete physical examination for signs of deficiency disease, and laboratory tests for detecting subclinical and latent as well as frank cases of deficiency. The laboratory tests for all of the subjects include "(1) a test of visual adaptation to dark using Hecht's adaptometer; (2) the concentration of vitamin C and that of inorganic phosphorus, calcium, and phosphatase in the blood; (3) the total serum protein, serum albumin, and globulin; and (4) the red cell count, hemoglobin, and hematocrit determination. In addition, vitamin B₁ excretion in the urine, the concentration of vitamin A in the blood, a bacteriologic test of free nicotinic acid in the blood, a measure of prothrombin concentration as an index of vitamin K deficiency, and a slit-lamp examination for evidence of riboflavin deficiency have been done on a large number of the subjects." Roentgenograms of the wrists and ankles for the customary clinical interpretation and for measurements of bone density with a photoelectric cell densitometer are also included.

The results to date show a high incidence of a deficiency of calories, protein deficiency among adults and older children, iron deficiency anemia among children and women, a high incidence (over 50 percent) of vitamin A deficiency, a 20 percent incidence of vitamin C deficiency, and low incidence of vitamin B₁ and vitamin D deficiency.

The interrelation of calcium and fat utilization in the growing albino rat, C. E. FRENCH. (*Pa. Expt. Sta.*). (*Jour. Nutr.*, 23 (1942), No. 4, pp. 375-384).—In the tests described young rats selected in sets of four from a litter were placed on an experimental regime involving a 4-day preliminary period and a 40-day period of excreta collection, following which the animals were sacrificed for analysis. Each rat of a set of litter mates was fed one of the four synthetic experimental rations. These were so prepared as to provide, when fed in equicaloric amounts, essentially the same contents of protein, salts, calcium, phosphorus, and vitamin supplements, but to contain, respectively, 5, 15, 28, and 45 percent of fat. The first three of these diets permitted excellent growth, and the calcium utilization decreased moderately and consistently in the order

of increasing fat content. Forty-five percent of fat in the diet resulted in less growth and in the excretion of a larger number of fecal pellets; on this diet the utilization of calcium decreased considerably as compared with the utilization on the other diets. The most efficient utilization of calcium was obtained from the diet containing 1 gm. of fat to 0.60 gm. of calcium; and the efficiency of the utilization of the calcium decreased in the order of the increase in the ratio of fat to calcium in the diets. The utilization of the calcium paralleled the acidity of the intestinal tract, the most efficient utilization accompanying the most acid reaction, which pH determinations showed to result from the 5-percent fat diet. The data are discussed in relation to various theories concerning the physiological relationship between fat and calcium.

The effect of honey upon calcium retentions in infants, E. M. KNOTT, C. F. SHUKERS, and F. W. SCHLUTZ (*Jour. Ped.*, 19 (1941), No. 4, pp. 485-494, figs. 3).—Calcium balance studies on 14 healthy male infants less than 6 mo. old were made for a total of 120 metabolism periods in which the infants received milk formulas employing different types of milk, varying levels of vitamin D, and either corn sirup or honey as the source of carbohydrate. Magnesium balance, as reported earlier (E. S. R., 87, p. 596), was determined simultaneously in 89 of the metabolism periods involving 9 infants. Low calcium intakes tended to limit calcium retentions, but high intakes did not insure high retentions; the lowest calcium retentions occurred when 0.120 gm. of calcium per day was given with irradiated milk (and no additional vitamin D); retentions of calcium at low levels of vitamin D (up to 170 International Units per day) were higher with the evaporated milks, especially evaporated lactic acid milk, than with dried half-skim milk; but with high levels of vitamin D (from 680 to 1,000 I. U.) retentions were highest with the dried milk. In paired periods in which honey and corn sirup were used as sweetening agents in formulas given to the same infant, it was observed that calcium retentions were always higher with the formulas containing the honey. The increased retentions when honey was fed occurred both with low and with high intakes of vitamin D, and regardless of the type of milk fed or the use of lactic acid. It is concluded that honey is a type of carbohydrate well suited to the infant's needs and probably deserves a wider use in infant dietaries.

The nutritional importance of choline, W. H. GRIFFITH (*Jour. Nutr.*, 22 (1941), No. 3, pp. 239-253).—In this review the author discusses the relation of choline and of protein to liver lipides in older rats; of choline, cystine, and methionine to liver lipides in older rats; of choline to methylation of homocysteine, to hemorrhagic degeneration in young rats, to thiamin and other vitamins of the B complex, to phospholipid turnover in the liver, and to manganese in the prevention of perosis in birds; other effects of choline; relation of choline to unidentified dietary factors concerned with the metabolism and transport of lipides; and the daily requirement of choline in young rats. An extensive list of literature references is appended.

The significance of choline as a dietary factor, C. H. BEST (*Science*, 94 (1941), No. 2449, pp. 523-527).—An abbreviated version of a paper given at the University of Chicago fiftieth anniversary celebration, September 1941.

Quantitative distribution of phosphorus and calcium in certain fruits and vegetables, H. C. SHERMAN and M. S. RAGAN (*Jour. Nutr.*, 23 (1942), No. 3, pp. 283-292).—For most of the foods considered in this study, analyses were made of from 4 to 10 entirely separate specimens as obtained in city markets supplied from widely varied sources. In blackberries, currants, and raspberries, respectively, the seeds, constituting about 24, 17, and 15 percent of the weight of the fruit, showed about 6, 8, and 3 times as high a percentage of phosphorus as the flesh. The phosphorus content differed appreciably, therefore, depending upon

whether the edible portion was analyzed with or without the seeds. In the Flame Tokay grapes studied the percentage of phosphorus in the seeds was 3 times that in the flesh, but the seeds constituted so small a proportion (2.4 percent) of the whole fruit as scarcely to influence the average composition. Tomatoes, okra, and summer squash, with seed contents amounting, respectively, to about 3.5, 14, and 32 percent of the weight of the fruit, contained, respectively, about 15, 25, and 56 percent of their total phosphorus in the seeds. The phosphorus content of the edible portion, therefore, was measurably influenced by the inclusion or exclusion of the seeds. Pods and seeds of cowpeas and several varieties of beans, including samples at various stages of maturity, were analyzed for calcium and phosphorus. With increasing maturity, the seeds showed an increasing concentration of phosphorus and contained as high as from 90 to 97 percent of the total phosphorus, while the calcium concentration and content increased progressively in the pods. Separate analyses of the leaves, edible stems, and flower buds of broccoli showed a definite concentration of phosphorus in the flower buds and a still more pronounced concentration of calcium in the leaves. There was a well-marked concentration of calcium in the septa of oranges as compared to the reamed juice; the latter, even though containing the softer portions of the pulp, contained only 27 percent of the calcium of the edible portion.

Potassium in animal nutrition, E. ORENT-KEILES and E. V. MCCOLLUM (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 337-352, fig. 1).—A diet adequate in all other respects but containing only 0.01 percent K was prepared from purified foodstuffs. Rats on this diet showed roughened and thinning fur, a striking alertness, and a marked pica; grew slower than normal but lost no weight; showed lower food consumption and different water intake than the controls; and showed disturbances in fertility and reproductive behavior, which were, however, possibly due to inanition rather than K deficiency. Metabolic studies of the balance of N, Ca, P, Mg, Na, K, and Cl indicated that in spite of the low K intake the deficient rats were in equilibrium with respect to this element. Mg storage was 2.5 times greater in the rats on the K-low diet, and the Cl balance in these rats was negative. Tissue analyses showed that in the K-deprived rats the K in the muscle was lowered and Na was increased, which was exactly the opposite of the control tissues. K was also lower in the heart and kidney.

The effects of the substitution of bicarbonate for chloride in the diet of rats on growth, energy, and protein metabolism, L. VORIS and E. J. THACKER. (Pa. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 4, pp. 365-374).—Paired feeding experiments were conducted with rats on a synthetic diet with normal chloride content (0.28 percent) and with rats on the same diet in which the chlorides of the salt mixture were replaced by equivalent quantities of the corresponding bicarbonates. The chloride-deficient ration contained 0.02 percent chloride and 0.49 percent bicarbonate. "In comparison with the rats receiving the normal chloride ration, the chloride-deficient rats showed depression of appetite, increased consumption of water, increased heat production, and diminished body gain of nitrogen and energy. There was a smaller percentage gain of water on the basis of fat-free tissue, and the ratio of water gained to protein gained was significantly lower with the chloride-deficient rats than with the normal controls. The prevailing deficiency of chloride ion did not affect the digestion and absorption of nutrient energy but did prominently affect its disposal within the bodies of the rats."

Social implications of vitamins, R. R. WILLIAMS (*Science*, 94 (1941), Nos. 2447, pp. 471-475; 2448, pp. 502-506).—An address given at the fiftieth anniversary celebration of the University of Chicago, September 22, 1941.

[Vitamins studies of the Missouri Station] (*Missouri Sta. Bul.* 444 (1942), pp. 7-10, fig. 1).—This progress report (E. S. R., 87, p. 145) for the year ended

June 30, 1939, includes, in addition to work noted from other sources (E. S. R., 85, p. 851; 86, p. 422), studies on cataract in rats and on the adequacy of a milk ration, both by A. G. Hogan, L. R. Richardson, J. G. Lee, and E. L. Powell.

The effects of various vitamin supplements and of whole yeast on the digestion and absorption of the carbohydrate of a complete diet, R. A. RUSSELL and E. S. NASSET (*Jour. Nutr.*, 22 (1941), No. 3, pp. 287-294, fig. 1).—In experiments conducted on adult dogs with jejunostomies, it was demonstrated that fresh yeast has a distinctly stimulatory effect on gastrointestinal motility, which is often but not always accompanied by increased rates of digestion and absorption of carbohydrate; that dried yeast and a 50-percent alcohol-soluble extract of dried yeast have no effect on motility but increase by about 20 percent the rate of digestion and absorption; and that of the pure vitamins of the B complex now available, thiamin, riboflavin, nicotinic acid, and pyridoxin given as supplements to an already adequate basal diet have no effect, but pantothenic acid as calcium pantothenate has a marked effect on the rate of digestion and absorption of carbohydrates. It is suggested that crystalline pantothenic acid may be responsible for at least part of the yeast effect.

Absorption experiments with vitamin A, G. A. LEPAGE and L. B. PETT (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 747-761, figs. 4).—The absorption of orally administered vitamin A in doses of 10,000 International Units (three subjects) and of 300,000 I. U. (five subjects) was followed by determinations of the vitamin in the blood plasma at stated intervals for 24 hr. and in the feces at the end of the first, second, and third days. These experiments showed that the peak of concentration of vitamin A in the blood occurred on the smaller dosage at from 3 to 5 hr. and on the larger doses at 4 hr., but the highest proportion of the ingested dose accounted for as vitamin A in the blood was only 3.19 percent. In the same subject the amount recovered in the feces was 0.46 percent of the larger dose. Spectrographic investigation of the blood at 4 hr. and the feces for 3 days following the ingestion of 300,000 I. U. of vitamin A by three subjects revealed the presence of a substance the absorption curve of which showed a maximum at 275 m μ . Evidence was obtained that this substance, which was not present in control blood or control feces extracts or in the vitamin A concentrate used, is an oxidative product of vitamin A.

Vitamin A in blood and its relation to body reserves, P. C. LEONG (*Biochem. Jour.*, 35 (1941), No. 7, pp. 806-812, figs. 2).—Three young dogs were used as experimental animals in this investigation, which was divided into (1) a preliminary period of about 4 mo. (starting at 6 weeks of age), during which an adequate diet of known vitamin A content was given, (2) a dosing period of about 2½ mo. in which graded doses of vitamin A were administered and the content of the vitamin in the fasting blood was determined at intervals, and (3) a depletion period of about 16 mo. on a vitamin A-free diet. The total vitamin A intake during period 1 was 26,000 International Units and during the dosing period 56,000, 198,000, and 1,064,000 I. U., respectively.

The blood levels of vitamin A rose gradually during the dosing period and were proportional to the intake. As soon as the supplements were withdrawn the blood levels began to fall until zero levels were reached at 154, 138, and 168 days, respectively. Throughout the entire depletion period no signs of vitamin A deficiency were observed, and the dogs remained in a healthy condition. The female bore five young on the two hundred and seventy-sixth day of depletion, but her milk supply began to fail after about 3 weeks and three of the litter died in a short time. No vitamin A could be detected in their livers. At the end of the depletion period the blood of the three dogs was again examined for vitamin A and none was found. On autopsy the livers contained 70, 50, and 1,370 I. U. of vitamin A, respectively. These results are thought to

indicate that a low or negative A value for the blood of dogs cannot be taken to indicate that the vitamin A reserve is seriously depleted.

The results of the post-mortem examination are reported briefly in an appendix by H. F. Burn.

Vitamin A deficiency and the nervous system, S. B. WOLBACH and O. A. BESSEY (*Arch. Pathol.*, 32 (1941), No. 5, pp. 689-722, figs. 15).—The confusion concerning the relation of vitamin A deficiency to lesions of the central nervous system has been cleared by the discovery that if the deficiency occurs at a sufficiently early age it results in a disproportionate growth of the central nervous system with relation to the bony development and consequent mechanical injury to the brain, spinal cord, and nerve roots as a result of pressure. The detailed evidence reported in this paper, with numerous microphotographs of histological sections, is chiefly from experiments on white rats, but confirmatory experiments have been conducted on dogs. The epithelial changes in vitamin A deficiency are entirely unrelated to the presence or absence of the lesions of the nervous system, and the relation between the central nervous system and bone development is not altered in riboflavin and pyridoxin deficiency.

Vitamin B complex and fat metabolism, J. C. FORBES (*Jour. Nutr.*, 22 (1941), No. 4, pp. 359-364).—It is reported that in rats on a fat-free diet presumably adequate except for the B vitamins other than thiamin, which was administered as 0.2 mg. of thiamin chloride daily, the administration of either pyridoxin, riboflavin, or calcium pantothenate alone gave no increase in the concentration of neutral fat or cholesterol in the liver over that produced by thiamin alone; that the administration of both riboflavin and pyridoxin increased the neutral fat but not the cholesterol content of the liver; that the further addition of calcium pantothenate increased still further the neutral fat content and raised the content of cholesterol; and that nicotinic acid added to the other supplements produced a very striking increase in the liver cholesterol but not the neutral fat. Choline had a lipotropic action under all of the conditions studied, but the effect was less marked in the animals receiving nicotinic acid than in the other groups. Choline also reduced the amount of cholesterol in the liver but to a less extent in the presence of nicotinic acid.

The effect of a vitamin B complex deficiency on gastric emptying and small intestinal motility, G. W. HEUBLEIN, W. D. THOMPSON, JR., and J. P. SCULLY (*Amer. Jour. Roentgenol. and Radium Ther.*, 46 (1941), No. 6, pp. 866-875, figs. 10).—Roentgenographic observations on the dog on diets deficient in vitamin B complex and supplemented with vitamin B₁, with and without nicotinic acid and riboflavin, are reported and illustrated. These indicate that early in the acute phase of a vitamin B complex deficiency there is a marked delay in the gastric motility and a moderate delay in the motility of the intestines. Other appearances, including atony which later becomes evident throughout the small intestine, more nearly resemble those observed in multiple vitamin deficiency in human adults. Another point of similarity is frequently the immediate partial emptying of the stomach but a delayed emptying time. Nicotinic acid and lactoflavin exerted little, if any, effect on the downward course of the B deficiency. The administration of vitamin B₁ caused a temporary return to normal motility, but complete restitution did not occur until whole yeast was given by mouth. In the opinion of the authors "the treatment of hypomotility of the gastrointestinal tract in vitamin B deficiency demands other factors contained in whole yeast that are not supplied in lactoflavin, thiamin hydrochloride, and nicotinic acid."

The distribution of nicotinic acid in foods, L. J. TEPLEY, F. M. STRONG, and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 23 (1942), No. 4, pp. 417-423).—

The method of Snell and Wright (E. S. R., 87, p. 12) was found applicable to a wide variety of foods in the determination of nicotinic acid. Preliminary trials indicated that the nicotinic acid was stable to extraction by water, acid, or alkali. For most materials water extraction was satisfactory, but for complete extraction of cereals alkali or acid treatment was necessary. Recovery of nicotinic acid when added to a wide variety of materials ranged from 90 to 110 percent. In general, values obtained by the microbiological assay of dried meat samples agreed very well with those obtained earlier (E. S. R., 87, p. 150) by chemical analysis. The values obtained by the microbiological assay of food mixtures checked with the calculated values based on the assay of each component.

Data, expressed as milligrams percent, are reported for the nicotinic acid content of numerous fruits, vegetables, cereals, and miscellaneous materials. The values for fruits and vegetables, ranging from 0.10 to 2.18, fresh weight basis, indicated that these foods were not very good sources of nicotinic acid; on a dry weight basis carrots (14 mg. percent) and tomatoes (16.5 mg. percent) were the best of this group. Meats in general (15.7–45.5, dry basis), yeast (40–60), and peanut butter (18.6) were excellent sources; milk (0.08) and eggs (hard-boiled white, 0.076, and yolk, 0.035) were poor sources. Of the cereals, corn, oats, and rye (0.90–2.60 mg. percent) were quite low, while buckwheat, barley, and whole wheat were slightly richer (4.5–7.0). Most of the vitamin of the wheat was in the bran (25.7–40.0) and middlings (9.2–17.7), while patent flour contained only 0.80 mg. percent. White bread, enriched white bread, and 100-percent whole-wheat bread contained, respectively, 0.66–0.95, 1.51, and 2.88 mg. percent of nicotinic acid on the fresh weight basis.

The presence of free and combined thiamine in milk, N. HALLIDAY and H. J. DEUEL, JR. (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 555–561).—Protein-free filtrates obtained by ultrafiltration of milk contained on an average 25.0 γ of thiamin per 100 cc., as determined with the Prebluda-McCollum reagent and as corrected on the basis of the percentage of milk lactose in the ultrafiltrate. Treatment of the ultrafiltrate with phosphatase did not give a higher value for thiamin. Apparently, therefore, none of the thiamin in the ultrafiltrate was in the form of cocarboxylase (also dialyzable), since this would have been broken down by the phosphatase. On the basis of the amount of thiamin directly adsorbable on Superfiltrol, by the method of Emmett, Peacock, and Brown (E. S. R., 85, p. 727), an average value of 23.4 γ per 100 cc. was obtained. Preliminary treatment of the milk with phosphatase or takadiastase failed to increase the amount of thiamin determined, but preliminary treatment of the milk with either of these enzymes, aided by a proteolytic enzyme such as papain, gave values indicating an average level of 40.5 γ per 100 cc. These results indicated that about 60 percent or less of the thiamin in milk is in the free form, the rest being combined in a nondialyzable form, probably combined with phosphoric acid and protein. The averages for free and total thiamin, 23.4 γ and 40.5 γ per 100 cc., respectively, were obtained with samples of certified Holstein milk. These respective concentrations in the various milk samples were closely similar, with a coefficient of variation of about 10 percent.

Thiamin in sweat, L. L. HARDT and E. U. STILL (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 704–707).—Four groups of six college football players each underwent regular football practice, with no additional vitamins (two groups) and with supplements of 50 mg. of thiamin chloride and 750 mg. of ascorbic acid immediately before the practice (two groups). For one of each of these groups the exercise lasted 1 hr. and for the other 1½ hr., after which the subjects returned to a room at 80° F., drank 2 cups of warm tea, and stripped to the waist for collection of sweat from the back and front of the chest. A

10-cc. sample of blood and a complete sample of urine were obtained before and immediately after the exercise. These and the sweat samples were tested for ascorbic acid by indophenol titration and for thiamin by the fluorometric thiochrome method.

In the control groups the thiamin content of the sweat was double that of the urine after both periods of practice, but in both urine and sweat the values were somewhat lower after the longer period. In the supplemented groups the thiamin content of the sweat was 71 times that of the urine after the shorter period of exercise and only 8.5 times greater after the longer period. The thiamin in the blood tended to rise with sweating, particularly in the supplemented groups. The ascorbic acid values showed no marked or consistent changes with exercise. The blood values ranged from 0.53 to 0.84 mg. per liter before and from 0.56 to 0.78 mg. after exercise. The sweat values ranged from 1.76 to 4.66 mg. per liter, with a tendency to be somewhat higher in the supplemented groups and somewhat lower in the unsupplemented following the longer period of exercise.

It is estimated that a man at moderate work and in a moderate temperature may lose in sweat from 5 to 15 percent of ingested thiamin, and at harder work in higher temperature the amount lost may be enough to cause serious physiological consequences.

Further observations on induced thiamine (vitamin B₁) deficiency and thiamine requirement of man.—Preliminary report, R. D. WILLIAMS and H. L. MASON (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic*, 16 (1941), No. 28, pp. 433-438, fig. 1).—In continuation of the investigation noted previously (*E. S. R.*, 86, p. 278), 11 subjects were maintained on a diet furnishing between 0.40 and 0.45 mg. of thiamin daily, an amount not much if at all below the levels estimated to be provided in the diets classified as poor in the Stiebeling-Phipard survey (*E. S. R.*, 81, p. 142). Disturbing symptoms developed in 1 subject in 93 days, at which time thiamin was administered. Three of the subjects continued on the low-thiamin diet for 132 days, 5 for 169, and 2 for 196 days. Signs and symptoms of deficiency appeared at varied intervals, with the more active subjects the first to show symptoms. These are described in detail, particularly in comparison with those noted in the earlier report of the effects of complete absence of thiamin.

At the end of the period of restricted thiamin intake, 6 of the subjects were selected for study of thiamin requirements, of whom 3 were given 7.5 mg. of thiamin chloride daily for 37 days, after which all 6 were kept on a constant diet, with thiamin added in increasing amounts at 20-day intervals. Within 6 weeks the amounts excreted in the urine were essentially the same for both groups. The effects of the thiamin became evident only after the intake had reached or exceeded 0.5 or 0.6 mg. per 1,000 calories, and no further benefit was secured above 1 mg. per 1,000 calories. These findings are thought to indicate that "the optimal intake of thiamin of man is not less than 0.5 mg. and not more than 1.0 mg. per 1,000 calories obtained from a diet of ordinary composition."

The urinary excretion of thiamine as an index of the nutritional level: Assessment of the value of a test dose, H. L. MASON and R. D. WILLIAMS (*Jour. Clin. Invest.*, 21 (1942), No. 2, pp. 247-255, fig. 1).—This discussion of the value of the test dose procedure or of ordinary 24-hr. excretion of thiamin is based upon data secured in the authors' study of thiamin requirements noted above and here reported in detail. They conclude that determination of the 24-hr. urinary excretion of thiamin usually gives as much information as the test dose procedure, and that either determination alone or the two combined is a valuable laboratory aid in the clinical diagnosis of thiamin nutrition if the

intake of thiamin is properly controlled during the test. A balanced diet containing from 800 to 900 $\mu\text{g.}$ of thiamin is considered suitable for the purpose, and a table is given showing the composition of such a diet. Intramuscular injection of 1 mg. of thiamin chloride is recommended as a satisfactory test-dose procedure.

The data on the urinary excretion of five women following the administration of graded doses of thiamin indicated that 0.4 mg. of thiamin per 1,000 calories of diet represented the minimal requirement for these subjects. At this intake the average 24-hr. excretion of thiamin was 119 $\mu\text{g.}$, and 21 percent of the test dose was recovered. Excretion of 100 ± 10 $\mu\text{g.}$ or more in 24 hr. and recovery of at least 20 ± 2 percent of the test dose are considered evidence of adequate thiamin nutrition.

B₁ avitaminosis: Roentgenologic studies of gastrointestinal tract in rats on vitamin B₁ deficiency diets, J. GERSHON-COHEN, H. SHAY, and S. S. FELS (*Amer. Jour. Roentgenol. and Radium Ther.*, 46 (1941), No. 6, pp. 876-881, figs. 4).—In this work, conducted on rats and tested by introducing the water-barium meal directly into the stomach after an 18-hr. fast period, it was demonstrated that deficiency in vitamin B₁ alone is followed by gastrointestinal hypotonicity, dilatation, and stasis in proportion to the degree of deficiency, and that these changes are not accounted for by the mere loss in weight. No other vitamin than B₁ was studied.

Studies on nutritional achromotrichia in rats, K. UNNA, G. V. RICHARDS, and W. L. SAMPSON (*Jour. Nutr.*, 22 (1941), No. 6, pp. 553-563, figs. 3).—In studies conducted on approximately 2,000 black and piebald rats, evidence has been obtained that graying of the fur within from 3 to 7 weeks occurs (in the animals which survive) on a vitamin B complex-free diet supplemented with adequate thiamin, riboflavin, nicotinic acid, pyridoxin, and choline, with no pantothenic acid. Simultaneously with the graying there is a retardation of growth, the fur becomes coarse and scant, the whiskers have a blood-stained appearance, the nose becomes inflamed, and adrenal hemorrhages occur. The addition to the ration of 100 $\mu\text{g.}$ of calcium pantothenate prevents or cures the achromotrichia and the other signs and symptoms. The efficacy of whole dried liver and of rice bran in preventing or curing the achromotrichia was found to be proportional to their content of pantothenic acid, but the growth-promoting effect was greater. Black rats on B complex-free rations supplemented with thiamin, riboflavin, nicotinic acid, pyridoxin, choline, and pantothenic acid have been raised through three generations without graying except for some scattered gray hairs in the second and third generations.

Inefficacy of hormones in nutritional achromotrichia of rats, C. W. MUSHETT and K. UNNA (*Jour. Nutr.*, 22 (1941), No. 6, pp. 565-571, fig. 1).—The report of Morgan and Simms (*E. S. R.*, 84, p. 419) that extracts of the thyroid and adrenal cortex have been effective in curing achromotrichia in rats produced on a diet free from the filtrate factor, and of these authors and others that pathologic changes occur in the adrenals of rats maintained on diets deficient in pantothenic acid, led to this study of the effect of hormone administration on pantothenic acid-deficient rats, with particular reference to their influence on adrenal hemorrhage and achromotrichia. Daily administration of 0.25 and 0.5 cc. of adrenal cortical extract, 2.5 mg. of desoxycorticosterone acetate, 1, 5, and 10 mg. of thyroid, and 0.25 and 0.5 cc. of anterior pituitary extract was without effect in the prevention or cure of achromotrichia and also in the prevention of adrenal hemorrhages and other lesions occurring in rats on diets deficient in pantothenic acid.

TEXTILES AND CLOTHING

Cross-section-area method for determining density of wool fibers, J. I. HARDY and H. W. WOLF (*U. S. Dept. Agr. Cir. 654 (1942), pp. 10, figs. 5*).—The method developed consists in measuring the cross-section area of wool-fiber bundles under controlled conditions of temperature, humidity, and pressure. In the instrument designed for the purpose, the bundles of fibers are held in a slot 0.045 in. wide and 0.625 in. deep, and the depth of the fibers in the slot is measured with a thickness gage in thousandths of an inch under a dead-weight load of 5 kg. The new method was found rapid and reliable in a comparison with the gravimetric method A, consisting in weighing 100 fibers and relating their weight to the weight of the entire bundle; gravimetric method B, requiring the calculation of the weight of 100 fibers from the diameter, specific gravity, and length of fibers and relating this weight to the weight of the entire bundle; and a third method in which a bundle was cross-sectioned and each fiber was counted. Reliability was indicated by the fact that the correlation and regression coefficients of this method on actual fiber counts approach unity. With the use of the cross-section-area method about 50 samples can be measured in 8 hr., many more than the number weighed and counted by methods used previously.

A comparison of the aluminum-chloride and the sulfuric-acid methods for quantitative estimation of wool, L. W. DALE and R. EDGAR. (*Iowa Expt. Sta.*). (*Iowa State Col. Jour. Sci., 16 (1942), No. 3, pp. 391-397*).—The aluminum chloride and the 70-percent sulfuric acid methods for estimation of the wool of cellulose admixtures were compared for their effect on the weight, ash, total sulfur, and sulfate sulfur of plain woven-wool washed and extracted prior to treatment. The results are interpreted as indicating that the 70-percent sulfuric acid method is the better of the two.

The serviceability of garments as affected by varietal and regional differences in cotton fibers and methods of harvesting (*Texas Sta. Rpt. 1941, p. 88*).—A comparison of Acala and Rowden cottons, by M. A. Grimes, is briefly noted.

Synthetic fibers and textiles, H. M. FLETCHER (*Kansas Sta. Bul. 300 (1942), pp. 40, figs. 18*).—This popular bulletin gives information as to the nature of the raw materials and the methods of manufacture involved in making the various synthetic fibers; comments on the properties that make these fibers suitable for use in place of or along with the natural fibers; and discusses the matter of finishing to deluster, shrinkproof, mildew-proof, fireproof, prevent slippage, and render crease resistant and water repellent. The methods of caring for synthetic textiles, dictated by the physical and chemical properties of the fibers themselves, are discussed from the standpoint of dry cleaning, washing, and ironing. The serviceability of the fabrics under the action of light and heat and the influence of wear and cleaning is discussed. This information is based on laboratory tests which served to predict the relative usefulness of the various textiles, including those from natural fibers, synthetic fibers, and synthetic-natural fiber mixtures.

Central notations of ISCC-NBS color names, D. NICKERSON and S. M. NEW-HALL. (*U. S. D. A. et al.*). (*Jour. Opt. Soc. Amer., 31 (1941), No. 9, pp. 587-591, fig. 1; also in Amer. Dyestuff Rptr., 31 (1942), No. 12, pp. P292-P296, fig. 1*).—The central notations for the Inter-Society Color Council-National Bureau of Standards color names were developed to meet the need for color designations "sufficiently standardized to be acceptable and usable by science, sufficiently broad to be used by science, art, and industry, and sufficiently commonplace to be understood, at least in a general way, by the whole public." . . . The terms light, medium, and dark designate decreasing degrees of lightness, the adverb 'very' is added to extend the lightness scale to 'very light' and 'very dark.' The

adjectives weak, medium, strong, vivid, designate increasing degrees of saturation.

"In order that the unwieldy adjective combinations shall not be required, the following terms have been substituted for certain descriptions: Pale as a substitute for light, weak; brilliant as a substitute for light, strong; moderate as a substitute for medium, medium; dusky as a substitute for dark, weak; deep as a substitute for dark, strong. . . . These terms are used to modify the following hue or limited hue range names: Pink, red, orange, brown, yellow, olive, green, blue, purple, and combinations of these terms formed by using two of them, as in blue green, or an -ish suffix with one, as in purplish pink. For the neutral series the terms white, gray, and black are used." The abbreviations to be used for these color designations are given. Munsell notations for the ISCC-NBS central colors are here presented for the first time.

HOME MANAGEMENT AND EQUIPMENT

Farm families of two Vermont counties, their incomes and expenditures. M. MUSE (*Vermont Sta. Bul.* 490 (1942), pp. 48, figs. 4).—"This bulletin deals with the composition, income, and living expenditures of rural-farm families of Chittenden and Franklin Counties in Vermont's Champlain Valley. There was an average of four persons in the 1,012 families studied in this area who were headed by native-born husbands and wives. In 41 percent there were either three or four members, in 24 percent two, in 22 percent five or six, and in 13 percent seven or more. For the 960 families who received no 'relief,' the total family incomes averaged \$1,217 (\$700 cash, \$517 nonmoney income). There were less than \$250 in 3 percent, less than \$500 in 9, less than \$750 in 25, and less than \$1,000 in 46 percent of the cases; \$2,000 or more in 11 and \$2,500 or more in 5 percent of the cases. The cash living expenditures for 538 families averaged \$707; one-half of them were less than \$632, one-third less than \$500, and almost two-thirds less than \$750. The lowest tenth of the living expenses ranged from \$149 to \$335 and averaged \$266, while the highest tenth ranged from \$1,171 to \$2,200 and averaged \$1,482. Childless couples spent \$621, parents and one child \$659, and those with two children \$696. Slightly more than half of the families increased their proprietorship during the year, the increase amounting for the average family to \$25. . . . Food expenditures averaged \$252 per family, or 36 percent of the total cash spent for family living. Family use of the automobile and clothing each accounted for 11 percent and household operation for 10 percent of the total, while 12 other classes of items did for less than 1 to 6 percent. As the income rose, the amounts spent for food increased, regardless of family composition, and the percentages of total expenditures claimed by it tended to decrease."

Family spending and saving as related to age of wife and age and number of children. D. MONROE, M. Y. PENNELL, M. R. PRATT, and G. S. DUPUY (*U. S. Dept. Agr., Misc. Pub.* 489 (1942), pp. [4]+126, figs. 3).—This investigation of family spending and saving concerns families in small cities and villages and on farms in the Middle Atlantic and North Central region. The facts about income and consumption were obtained from schedules collected for the consumer purchases study in 1935-36 (*E. S. R.*, 84, pp. 717, 856). Summary tables showing ways of spending for each income class (\$500-\$999, \$1,000-\$1,499, \$1,500-\$1,999, \$2,000-\$2,999, \$3,000-\$4,999, and \$5,000 or over) for each of the 16 family-composition groups in each of the three types of communities are presented, together with tables giving greater detail concerning the distribution of certain expenditures. The data are discussed only with reference to village families. It is pointed out, however, that the intergroup differences found in

villages tend to be repeated in the farm and urban samples. Analysis of the data showed that the ways of using family funds differed with age. Families in which the wife was under 30 spent more of their income and saved less and had a greater tendency to spend more than they made than families in which the wife was 60 or more years. Clothing and personal services, the automobile, furnishings and equipment, recreation, and tobacco took a larger share of the funds of the younger families than of the older group, but the latter just about balanced the difference by the greater money value of the year's housing, household operation, food, gifts, and welfare. "Since patterns of consumption do not change rapidly in normal years, the ways of income use shown by this report provide a reasonably accurate picture of financial management practices of families throughout the latter half of the thirties up to the period immediately preceding the war, when changes in the price level and anticipated shortages affected family spending."

Studies in family life, L. S. STOTT (*Nebraska Sta. Rpt.* [1941], p. 78).—A progress report.

"Ready for school," D. DICKINS (*Miss. Farm Res.* [*Mississippi Sta.*], 5 (1942), No. 8, pp. 1, 6).—It is emphasized that getting ready for school means more than attending to the clothing supply, and involves correcting physical defects and eating more adequately. The relation of these factors to scholarship and deportment was shown by a survey in five elementary schools in one county in Mississippi. Scholarship and deportment records of the pupils were studied in relationship to the physical examination records. It was found that only about 15 percent of the children rated as poor students were in excellent physical condition, and that nearly twice as many children were rated as having fair or poor deportment in the group having poor physical condition as in the group having good physical condition. The most common defect was in the gums and teeth, and next most common were poor condition of throat and glands.

MISCELLANEOUS

Serving Arkansas agriculture: Fifty-third Annual Report [of Arkansas Station, 1941], [W. R. HORLACHER] (*Arkansas Sta. Bul.* 417 (1941), pp. 47, figs. 6).²

Agricultural investigations: Work of the [Missouri] Agricultural Experiment Station during the year ending June 30, 1939, M. F. MILLER, S. B. SHIRKY, H. J. L'HOTE, ET AL. (*Missouri Sta. Bul.* 444 (1942), pp. 106, figs. 6).²

Fifty-fifth Annual Report of [Nebraska Station, 1941], W. W. BURE (*Nebraska Sta. Rpt.* [1941], pp. 96, figs. 8).²

Fifty-fourth Annual Report [of Texas Station], 1941, A. B. CONNER ET AL. (*Texas Sta. Rpt.* 1941, pp. 202).²

Mississippi Farm Research, [August 1942] (*Miss. Farm Res.* [*Mississippi Sta.*], 5 (1942), No. 8, pp. 8, figs. 5).—In addition to articles noted elsewhere in this issue, this number contains **Our Stake in Program of Price Control**, by R. J. Welch (pp. 1, 2); and **Forecasts of Good Harvest for This Year's Farm Crops** (p. 8).

List of available publications of the United States Department of Agriculture, F. L. ZIMMERMAN and P. R. READ (*U. S. Dept. Agr., Misc. Pub.* 60, rev. (1942), pp. [1]+I+227).—This is a revision (*E. S. R.*, 62, p. 497) to January 2, 1942.

² The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Georgia Station.—A total of 17 employees are now in the armed service. Thomas S. Boggess, Jr., assistant chemist, has accepted a position with the U. S. Department of Agriculture at the Georgia Coastal Plain Station. Dorothy Mad-dox has been succeeded as nutritional laboratory assistant by Mary Renfroe.

Mississippi College and Station.—Dr. James E. Adams has been appointed superintendent of the Delta Substation vice H. C. McNamara, who died last April. T. E. Ashley, associate professor of horticulture and associate horticulturist, has been appointed superintendent of the South Mississippi Substation vice Dr. J. C. Robert, retired, and has been succeeded by Troy H. Jones.

New Mexico College and Station.—Drs. G. N. Stroman, associate agronomist, and E. Cooper Smith, assistant chemist, have been granted leave of absence for military service. R. P. Callaway, associate agricultural economist, has resigned to accept a position with the U. S. D. A. Agricultural Marketing Service and has been succeeded by Morris Evans. K. A. Valentine has been appointed assistant animal husbandman.

Cornell University and Station.—The retirements are noted of R. S. Hosmer, head of the department of forestry, and George N. Lauman, professor of rural economics.

Pennsylvania College and Station.—Dr. F. F. Lininger has been appointed director of the station as of October 1. Dr. S. W. Fletcher, dean of the School of Agriculture, will continue as its chief executive officer in charge of instruction, research, and extension.

Members of the station staff in military service include Drs. Alex Black and A. L. Voris, assistant professors of animal nutrition; C. E. French, instructor in animal nutrition; M. K. Goddard, assistant professor of forestry; H. B. Musser, professor of experimental agronomy; and Dr. H. N. Worthley, professor of economic entomology. Drs. G. E. Brandow and H. R. Cottam, assistant professors of agricultural economics and rural sociology, respectively, are serving with the U. S. Office of Price Administration. Carl Wild, assistant professor of landscape architecture, is engaged in work in connection with defense housing.

Vermont University and Station.—Dr. H. R. Varney, extension agricultural economist, has been appointed assistant dean of the College of Agriculture and assistant director of the station and extension service. Dr. W. R. Adams, associate professor of botany and associate botanist, has been granted leave for military service. Dr. N. N. Allen has been appointed associate professor of dairy production and associate animal and dairy husbandman. Margaret M. Cowles, assistant in home economics research, has resigned to accept a position as dietitian in Houston, Tex.

Association of Land-Grant Colleges and Universities.—In addition to the general officers noted on page 4, the following section officers were elected at the Chicago meeting of October 28-30, 1942: Agriculture, L. E. Call of Kansas, chairman, W. W. Clark of Wisconsin, vice chairman, and W. G. Taggart of Louisiana, secretary; engineering, H. A. Curtis of Missouri, chairman, and S. S. Steinberg of Maryland, secretary; home economics, Nora A. Talbot of Oklahoma, chairman, Laura W. Drummond of Pennsylvania, vice chairman, and Florence Harrison of Missouri, secretary; and graduate work, W. C. Russell of

New Jersey, chairman, and J. C. Jordan of Arkansas, secretary. Within the section of agriculture, the subsection of experiment station work elected L. D. Bayer of North Carolina as chairman, and C. R. Orton of West Virginia, secretary; the subsection of resident teaching, J. G. Lee, Jr., of Louisiana, chairman, and A. M. Eberle of South Dakota, secretary; and the subsection of extension work, P. O. Davis of Alabama, chairman, and B. H. Crocheron of California, secretary.

In general, expiring assignments to the standing committees were filled by new appointments, but no changes were made in the joint committee on publication of research or in the special committees on relationships, accrediting, and preservation of phosphates and their national use. On the committee of college organization and policy J. L. Morrill of Wyoming and John S. Millis of Vermont succeeded A. C. Willard of Illinois and C. E. Friley of Iowa; on instruction in agriculture Edwin G. Woodward of Connecticut replaced Cornelius Betten of New York; on instruction in engineering N. A. Christensen of Colorado and Joseph Weil of Florida succeeded H. A. Curtis of Missouri and L. J. Lassalle of Louisiana; and on instruction in home economics Marie Dye of Michigan and Wylle B. McNeal of Minnesota succeeded Frances Zull of Wisconsin and Lita Bane of Illinois.

The committee on experiment station organization and policy was enlarged by the appointment of four additional members. In addition to the secretary of the experiment station subsection and the Chief of the Office of Experiment Stations, *ex officio*, it now consists of the following: W. H. Martin of New Jersey, R. E. Buchanan of Iowa, P. S. Burgess of Arizona, and Agnes Fay Morgan of California for 4 years; C. E. F. Guterman of New York, Noble Clark of Wisconsin, Jessie W. Harris of Tennessee, and Clarence Dorman of Mississippi for 3 years; Edmund Secrest of Ohio, J. A. Hill of Wyoming, Mary M. Clayton of Maine, and C. H. McDowell of Texas for 2 years; and M. J. Funchess of Alabama, E. C. Johnson of Washington, R. B. Corbett of Maryland, and Margaret S. Fedde of Nebraska for 1 year. Its subcommittee on home economics was unchanged except that Mary W. Clayton of Maine replaced Esther L. Batchelder of Rhode Island.

On extension organization and policy H. C. Saunders of Louisiana succeeded E. E. Scholl of Oklahoma for 1 year, and P. O. Davis of Alabama and Claribel Nye of California were named for 4 years vice D. W. Watkins of South Carolina and Azalea L. Sager of Oregon. On military organization and policy E. O. Holland of Washington was reappointed for 1 year, and J. W. Harrelson of North Carolina and Alfred Atkinson of Arizona were named for 3 years, the former vice H. C. Byrd of Maryland. N. W. Dougherty of Tennessee succeeded M. L. Enger of Illinois on the committee on engineering experiment stations.

The special committee on radio received two new members, H. J. C. Umberger of Kansas and R. M. Green of Colorado, vice J. W. Harrelson of North Carolina and W. W. Clark of Wisconsin. H. H. Hume of Florida replaced G. D. Humphrey of Mississippi on the committee of land-grant institutions for Negroes, and C. B. Hutchison of California became a delegate to the American Council on Education vice F. M. Hunter of Oregon.

As to the special committees for 1943, F. E. Balmer of Washington retired from that on rural youth. Additional committees were set up as follows: Soil survey, Richard Bradfield of New York, chairman, W. H. Pierre of Iowa, and L. D. Bayer of North Carolina; post-war problems, E. J. Kyle of Texas, chairman, T. W. Schultz of Iowa, and W. I. Myers of New York; and training for Government service, C. E. Friley of Iowa, chairman, F. C. Smith of Tennessee, and C. L. Christensen of Wisconsin.

EXPERIMENT STATION RECORD

VOL. 88

February 1943

No. 2

RESEARCH AT THE 1942 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

The research program of the 1942 convention, held in Chicago last October (E. S. R., 86, p. 1), inevitably reflected the impacts of the war. Although research agencies are likely to be associated in the public mind primarily with the problems of peace, when hostilities threaten they are immediately confronted with new responsibilities and opportunities. Particularly is this true of public service institutions such as the State experiment stations. Under these circumstances the annual conventions of a body such as the Association of Land-Grant Colleges and Universities are first of all occasions for group consideration of the new situations and adjustments which they entail.

Expressed in general terms, the immediate problem becomes one of effective mobilization for the emergency. This situation was well depicted by Director C. B. Hutchison of California in a paper presented before a joint session of the sections of resident teaching experiment stations, and graduate work. Speaking on the topic *How May Research, the Undergraduate, and the Graduate Programs Be More Effectively Coordinated for the War Effort*, he pointed out that these agencies "know as well as anyone, and perhaps better than most, that in the present situation we cannot possibly have 'education and research as usual.' They have pledged their resources, their man and woman power and facilities, totally to the Nation in this crisis. They want these resources used. They are ready to set aside until this war shall have been brought to a successful conclusion any of the things they have been doing and undertake others if only they can be assured that this is their best contribution to the general cause."

Each institution, in his opinion, must determine its own means of effecting the necessary coordination with the war effort. In the case of the stations he maintained that in times of peace their programs "are designed to afford the factual basis for the advancement of agriculture and the enrichment of rural life. To accomplish these ends we direct our efforts to the discovery of facts which when assembled,

synthesized, and translated into practice will advance the efficient and economical production, protection, processing, distribution, and utilization of foods and fibers and promote the protection and conservation of the Nation's resources, human as well as natural, which are used in doing these things. These are appropriate agricultural research war aims, too, in a total war, although emphasis may need to be shifted from certain lines of work to others in the immediate future if we are to aid agriculture most in the gigantic tasks it is being called upon to perform. In general, we shall need to give more attention to immediate needs and less to those of long-term significance, for unless we win this war long-term research will be of little consequence. It is not likely that anything which may be done this year or next on some of our so-called long-time basic projects will have much, if any, effect upon the outcome of the war. On the other hand, it is quite possible that important contributions to the food production programs and the promotion of better nutrition among the people may result from efforts directed toward the diagnosis, assembling of information already extant, synthesis, filling in gaps here and there through short-time approach, and translation of it all, as rapidly as may be possible, into practice."

In a further discussion of the same topic, Dean I. O. Schaub of North Carolina drew attention to some of the complications confronting an apportionment between teaching, research, and extension of available manpower within an institution. "Practically all of our graduate students, some of whom helped in the instructional field as well as in research, are gone. A number of the members of our staff have gone into the Army, either through the Reserve Officers Corps or through selective service, while others have gone into industrial work. Full replacement with qualified men is impossible. Adding to this situation is the enormous demand for assistance of practically all members of our staff in governmental programs and from commercial people who need technical advice in adjusting their business in a topsy-turvy world. These demands cannot and should not be ignored. The combined effect of this pressure from all sides creates an almost impossible situation, and yet a solution must be found. . . . Sooner or later it is coming to the point where a decision must be made as to what is of the least importance and which can be discontinued with the least damage."

In the section of home economics much attention was given to the national cooperative project on the conservation of the nutritive values of foods in the process of marketing, storage, and home preparation. This project had been sponsored by the section at the 1941 convention, and developments had proceeded with Dr. J. T. Jardine, Chief of the Office of Experiment Stations, as coordinator and with

four regional coordinators. Progress reports were submitted by Sybil L. Smith of the Office of Experiment Stations and for the several regions by Director C. McKee of Montana and Dr. Agnes F. Morgan of California, Margaret Fedde of Nebraska, Dr. Statie E. Erickson of Kentucky, and Dr. B. E. Gilbert of Rhode Island. These reports brought out the fact that at least 38 States were participating in the project and that federally supported work of similar scope was under way in at least 5 others. Over 50 commodities were under investigation, with special emphasis on the 10 or 12 foods or food groups deemed of particular significance under present conditions. One of the features of special interest has been the usually broad cooperation between and within the institutions concerned.

Each of the two sessions of the experiment station subsection was devoted to a problem of immediate concern to the directors. One of these dealt with Federal grants, and was discussed in a closed session at which the principal speakers were Director C. E. F. Guterman of Cornell on the topic of Grants to States and Director R. E. Buchanan of Iowa on Grants to Bureaus and Federal Agencies for Cooperation With the States.

The other session dealt with the problem of acquainting the public with experiment station work. Four methods were discussed, those of personal interviews by Director Edmund Secrest of Ohio, publications by Director E. C. Johnson of Washington, organizations by Director W. G. Taggart of Louisiana, and demonstrations by Director L. D. Baver of North Carolina. While the general topic is not a new one, its timeliness needs little justification in a period when full understanding of the significance and value of all publicly supported agencies is unusually important. The papers as a whole indicated, in the words of one of them, that "experiment stations can in numerous ways place before the public the results of meritorious but perhaps in the main unspectacular work. It is up to the stations to find means of doing this job."

An effective presentation of some of the more recent research accomplishments was made by a nonmember of the association, Dr. W. H. Tisdale, manager of the pest control research section of E. I. du Pont de Nemours and Company, Incorporated. Dr. Tisdale, who was the research spokesman in the joint session of the three subsections of agriculture, commended the rapid progress in recent years in the organization and administration of agricultural research institutions. "Agricultural problems," he said, "are being viewed in their broader aspects. Better balanced programs of research are being organized, which include all phases of the agricultural sciences from soil care and improvement to the marketing of the well-graded and packaged products, both plant and animal production included.

Not only have professional bounds been made more flexible, resulting in closer cooperation of individuals and divisions within institutions, but the trend is toward the much needed regional, national, and international cooperation. Only through such cooperation and coordination of effort can these problems be viewed in their broad, as well as in their more local, aspects and larger numbers of trained minds, representing the different sciences and professions involved, employed in their solution. This is the way it should be." Nevertheless he contended that "many of these tasks are of proportions that will require greater painstaking efforts and more extensive cooperation than anything we have yet experienced."

As to the future, he pointed out that "since our declaration of war there has been and there will continue to be curtailment of many meritorious investigations, and special consideration will be given to those problems which are of urgent necessity in the war effort. No one will take exception to this. After we have won the war we will be able to reconsider our agricultural research programs. Many of our trained young research men will return from the front, and those who have remained at home on vital war production research will be available to take their places in a more permanent order. If the ideals set forth in the Atlantic Charter are to prevail, research in all its phases, and especially its international phases, must and will surpass anything yet known, and agricultural research will take its place near the top in the new scheme of things."

A similar appreciation of the post-war opportunities open to the stations was expressed in a paper by Director R. B. Corbett of Maryland entitled *The Experiment Stations' Job in Post-War Planning*. Looking ahead, Director Corbett predicted a severe economic crisis, with price disorganizations, much unemployment, a depressed state of buildings and equipment, and many other conditions needing immediate remedies for which the basis must be laid in research programs with the State experiment stations as essential agencies. He concluded that "the vision and intelligence of experiment station directors is needed now and will be needed in the post-war period as it has never been needed in the past."

Taken as a whole, the convention revealed the research representatives as alert, responsive, and cooperative. Long since have their programs been geared to the war emergency. Despite depleted staffs and many other handicaps, they can be depended upon to render to the extent of their resources the maximum service possible along their appointed lines.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Advances in colloid science, edited by E. O. KRAEMER, in collab. with F. E. BARTELL and S. S. KISTLER (*New York: Interscience Pubs., Inc., 1942, vol. 1, pp. XII+434, figs. [160]*).—This volume, the first of a projected series, consists of a preface by Kraemer, Bartell, and Kistler and discussions of 12 topics by the authorities in their respective fields noted below: The Measurement of the Surface Areas of Finely Divided or Porous Solids by Low Temperature Adsorption Isotherms, by P. H. Emmett (pp. 1-36); The Permeability Method for Determining Specific Surface of Fibers and Powders, by R. R. Sullivan and K. L. Hertel (pp. 37-80) (Tenn. Expt. Sta.); A New Method of Adsorption Analysis and Some of Its Applications, by A. Tiselius (pp. 81-98); Solubilization and Other Factors in Detergent Action, by J. W. McBain (pp. 99-142); Recent Developments in Starch Chemistry, by K. H. Meyer (pp. 143-182); Frictional and Thermodynamic Properties of Large Molecules, by R. E. Powell and H. Eyring (pp. 183-226); The Constitution of Inorganic Gels, by H. B. Weiser and W. O. Milligan (pp. 227-246); The Creaming of Rubber Latex, by G. E. Van Gils and G. M. Kraay (pp. 247-268); Streaming Birefringence and Its Relation to Particle Size and Shape, by J. T. Edsall (pp. 269-316); Synthetic-Resin Ion Exchangers, by R. J. Myers (pp. 317-351); The Study of Colloids With the Electron Microscope, by T. F. Anderson (pp. 353-390); and Anomalies in Surface Tensions of Solutions, by E. A. Hauser (pp. 391-415).

[**Chemical investigations by the New York State Station**] (*New York State Sta. Rpt. 1942, pp. 19-23, 27-29, 32-34*).—These comprised work on food processing, paper investigations, cleaning and sterilizing studies, food poisoning organisms, biological stains, nonpoisonous insecticides, preparation and preservation of fruit juices and beverages and of vegetable juices, maple products investigation, physical and chemical properties of insecticides and fungicides—their analysis and evaluation, adhesion of fungicides to plant surfaces, and protein investigations with casein-aldehyde plastics and the effect of light on amino acids, proteins, and allied substances.

✓ **A chemical study of quick-test technics for potassium and calcium**, S. W. MELSTED. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 34 (1942), No. 6, pp. 533-543, figs. 2*).—This article covers a chemical evaluation of various technics involved in quick tests for potassium and calcium. The author points out that the principal factor which determines the accuracy of a quick test for replaceable bases is the quantitateness with which the extracting solution removes the bases from the soil. With this in mind, it is suggested that the first consideration must be the extracting solution. Results obtained indicate that there is no one extracting solution in use for rapid tests that is quantitative for all the replaceable bases, and in the opinion of the investigator, a single extracting solution now in general use for all nutrients should be discouraged. The limitations of quick-test methods that measure the aliquot of extract in drops, as well as

turbidimetric or colorimetric methods that do not give accurate results with standard solutions, are discussed.

Comparison of dry combustion and Walkley-Black methods for the determination of organic carbon distribution in soil profiles, C. E. HUTTON and R. W. SIMONSON. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 6, pp. 586-592, fig. 1).—Recoveries of carbon by the Walkley-Black method (E. S. R., 70, p. 742) are compared with data obtained by a dry combustion method for the principal horizons of 12 soils representing 6 great soil groups. While approximate values for organic carbon can be obtained by means of the Walkley-Black method, the variations in recovery are often large enough to obscure important differences between the various horizons in the same profile or similar horizons in different profiles. The deviations were considered too large to permit the general use of the more rapid procedure for the study of carbon distribution in soils.

Determination of silica and phosphoric acid in soil extracts, A. SREENIVASAN (*Soil Sci.*, 54 (1942), No. 1, pp. 27-33).—A rapid method for separating silica from soil extracts quantitatively consists in evaporation to small volume and digestion with sulfuric acid and alcohol. Following this the silica, after precipitation, is filtered off, and the phosphate in the filtrate is determined titrimetrically in the phosphomolybdate precipitate.

A new method for determining the concentration of chlorophyll, D. I. SAPOZHNIKOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 32 (1941), No. 5, pp. 369-371, fig. 1).—The method described is based on measurement of the absorption band I in the spectrum of chlorophyll by means of a drum spectrometer.

Application of volatile fatty acidity determination to a study of canned Maine sardines, J. A. CLAQUE (*Food Res.*, 7 (1942), No. 1, pp. 56-67, figs. 3).—The author concurs with Hillig (E. S. R., 82, p. 441) in finding that volatile fatty acidity may be used as an index of the quality of canned sardines from the standpoint of measuring deteriorative changes which have taken place in the sardines up to the time of canning. The test shows up differences in quality which are not obvious to the average person by organoleptic examination.

Strong brines inhibit the development of volatile fatty acidity. Sardines held in a 60°-65° salometer brine after equilibrium between the brine and sardines had become established showed practically no increase in volatile fatty acidity even after a holding period of 50 hr. The lowest concentration brine to have any practical inhibiting effect would be a 30° brine (after equilibrium). High holding temperatures accelerate the development of volatile fatty acidity in sardines. There was no definite correlation between bacterial count and volatile acid number in the one series of tests made on raw sardines. Under cannery conditions the factor most likely to cause an appreciable increase in volatile fatty acidity is the holding of sardines in the open can after packing.

Determining the maturity of frozen vegetables: A rapid objective method for whole-kernel corn, F. A. LEE, D. DEFELICE, and R. R. JENKINS. (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, pp. 240-241).—The method developed, described as to procedure, equipment, and calculation, involved determination of specific gravity by difference in weight in air and in a mixture of xylene and carbon tetrachloride adjusted to sp. gr. 1.000; or by difference in weight in air and in a weak brine solution of sp. gr. 1.000. The brine method was somewhat the better of the two because of the low cost, ease of preparation, and relative stability of the brine solution in use. The specific gravity results by either method correlated well with organoleptic tests, as indicated by the calculated coefficients of correlation. Tentative standards

are suggested, therefore, based upon results using the brine solution for the determination of specific gravity. According to these standards corn is graded fancy if the specific gravity in brine is 1.080-1.118; reject, immature if 1.079 and lower; and reject, overmature if the specific gravity is 1.119 and higher.

Objective methods for determining the maturity of frozen whole kernel corn, F. A. LEE and D. DEFELICE. (N. Y. State Expt. Sta. et al.). (*Canner*, 94 (1942), No. 26, pp. 11-13, 24).—The method described is the same as that noted above. In addition, slight alterations for alcohol-insoluble solids are noted, thus making the method applicable to frozen whole-kernel corn as well as to the corresponding canned product. Consideration is also given to total solids as a method for determining the maturity of frozen whole-kernel corn.

Determination of the maturity of frozen peas, F. A. LEE. (N. Y. State Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 3, p. 241).—A revision of the method for determining the maturity of frozen peas (E. S. R., 85, p. 153) involved replacing the xylene-carbon tetrachloride mixture with a sodium chloride solution of sp. gr. 1.000. This solution possesses the advantage of being less expensive, easier to prepare, and subject to less change in specific gravity in use.

Genetic control of biochemical reactions in *Neurospora*, G. W. BEADLE and E. L. TATUM (*Natl. Acad. Sci. Proc.*, 27 (1941), No. 11, pp. 499-506, figs. 2).—On the assumption that X-ray treatment would induce mutations in genes concerned with the control of known specific chemical reactions, a procedure was devised using the ascomycete *Neurospora* for discovering and maintaining such mutant strains. Out of about 2,000 X-ray induced mutant strains, 3 were found that grew essentially normally on the complete medium (agar, inorganic salts, malt extract, yeast extract, and glucose) and scarcely at all on a minimal medium (agar, inorganic salts, biotin, sucrose, and fat), requiring the organism to carry on all the essential syntheses of which it is capable. In one of the mutant strains established, the ability to synthesize pyridoxin was wholly or largely lost; in a second, the ability to synthesize the thiazole half of the thiamin molecule was absent; and in a third, *p*-aminobenzoic acid was not synthesized. All of these substances appeared, therefore, to be essential growth factors for *Neurospora*. The growth of the pyridoxinless mutant was shown to be a function of the pyridoxin content of the medium on which it was grown. Growth was measured by the dry weight of the mycelia or by a method, described, involving the progression of the frontier of the mycelia along a horizontal glass culture tube half filled with an agar medium. The results of crosses between normal and mutant strains indicated that the inability to synthesize the pyridoxin was apparently differentiated by a single gene from the ability of the organism to elaborate this essential growth substance. The possibility of using the growth of *Neurospora* strains in the described tubes as a basis of vitamin assay is suggested, but it is also emphasized that additional investigation is essential in order to determine the reproducibility and reliability of the method.

Study of problems in enrichment of flour, C. G. HARREL ET AL. (*Southwest. Miller*, 21 (1942), No. 25, pp. 19, 39).—This report, by a subcommittee of the technical committee of the Millers' National Federation, is concerned with additional work (E. S. R., 86, p. 564) on various phases of the enrichment program and includes brief reports on the following studies: I—Fate of riboflavin on baking, by J. S. Andrews; II—loss of vitamin B₁ on baking, by E. Hove; III—color and other changes in bread score caused by the use of riboflavin at the proposed enrichment levels, by W. L. Rainey; and IV—the effect of iron salts when used at the enrichment level, with special reference to stability both in

flour and in the concentrate, by B. Sullivan. These studies, outlined briefly, are summarized as follows:

I. Breads, produced on the commercial scale as well as in laboratory tests, showed no measurable changes in the amount of riboflavin either during fermentation or baking regardless of whether the riboflavin was added to the dough as the pure product or was derived from the flour, whole wheat, yeast, or milk. The riboflavin content of the flour was not affected by bleaching.

II. The higher the baking temperature and the longer the baking time the greater the loss of thiamin regardless of its source (whole wheat, or added synthetic vitamin or vitamin-rich yeast). At normal temperatures and times, practically all of the loss, which averaged about 16 percent in the well-baked loaf, occurred in the crust rather than in the crumb.

III. Color scores, by 10 separate laboratories, of breads made from bleached and unbleached flour, the former with and without the addition of dried skim milk (6 percent) or pure riboflavin (1.2 mg. per pound of flour), indicated that the pure riboflavin imparted a clear creamy color to the crumb of the bread. The amount of riboflavin used contributed more color than did the 6 percent of dried skim milk, but not as much creamy color as did the unbleached flour.

IV. "Experiments on keeping qualities, supplemented by over a year's experience, indicate that if any enriched flour goes out of condition it is not necessarily the presence of the iron added which caused this deterioration, since the unenriched flour, under the same conditions, might have developed rancidity. As the amount of iron is increased, the tendency toward rancidity becomes more marked. Traces of copper have also been found to promote the development of rancidity. It is generally felt, however, that at the present or proposed levels for iron in enriched flour more depends on the nature of the flour itself and its storage conditions than on the exact amount of iron added."

Some problems in enrichment of flour, C. G. HARREL ET AL. (*Bakers Digest*, 16 (1942), No. 11, pp. 249-251, figs. 2).—Essentially noted above.

Die Bestimmung von Carotin in Pflanzen [The determination of carotene in plants], K. SVANHOF and H. DAM (*Ztschr. Vitaminforsch.*, 11 (1941), No. 4, pp. 361-372; *Eng., Fr. abs.*, p. 372).—The present study involved a comparison of the method of Glavind and Heegaard (*E. S. R.*, 85, p. 441) with the official (Danish) method. This latter involved digestion of the plant material with alcoholic KOH, extraction of the pigments with petroleum ether, and treatment of this extract with a methyl alcohol-petroleum ether mixture, by which treatment the pigments were partitioned between the methyl alcohol and the petroleum ether. After proper washing of the layers, the pigment in the petroleum ether phase was determined by means of the photoelectric colorimeter. In the application of these methods to dried spinach, alfalfa, and carrots, it was found desirable to complement the methods by chromatographic separation of the physiologically active carotene. This was accomplished by absorption on a column of Al_2O_3 , the chromatograph being developed with a petroleum ether-benzene mixture, and the carotene being eluted from the upper layer with a solution of alcohol in petroleum ether. For the examination of dried plants, a simplified Willstätter-Stoll method (*E. S. R.*, 30, p. 311) was preferred along with chromatographic separation. By the simplified method, the separation of the carotenoids into two phases was eliminated. In the chromatographic procedure a portion of the carotenoids was lost, this loss averaging about 8.2 percent in the official method, 8.7 percent in the method of Glavind and Heegaard, and about 7.6 percent in the simplified method. A correction factor for these losses was applied, therefore, in results obtained by these several procedures.

Remarks on the determination of vitamin A and carotenoids in feces, T. K. WITB (*Ztschr. Vitaminforsch.*, 11 (1941), No. 4, pp. 298-310; *Ger., Fr. abs.*, pp. 309-310).—"The chemical aspect of the determination of carotenoids and vitamin A in feces is discussed. Owing to the heterogeneous nature of feces, the analysis is difficult to carry out exactly for carotenoids, and in the case of vitamin A it is only possible to arrive at a rather rough estimation. Analytical methods used by previous investigators are described and criticized, and some methods in keeping with modern knowledge of the chemistry of vitamin A and carotenoids described in detail."

The effect of enzymatic digestion on the pantothenic acid content of meats determined by the microbiological method, H. A. WAISMAN, L. M. HENDERSON, J. M. MCINTIRE, and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 23 (1942), No. 3, pp. 239-248).—The pantothenic acid content is reported for more than 80 samples of animal tissues, many of which were samples analyzed earlier by the chick-assay method (*E. S. R.*, 82, p. 231). The pantothenic acid was extracted from dried pulverized or fresh homogenized samples subjected to pancreatic digestion for from 24 to 72 hr. at 38° C. in a phosphate buffered solution at pH 7.0-7.5. The medium, culture, inoculation, and titration procedures used were essentially those reported by Strong et al. (*E. S. R.*, 86, p. 588). Preliminary tests showed that the water-extraction procedure of this method failed to give complete extraction of many animal tissues; autolysis, enzymic digestion with pepsin, with clarase, and with pancreatin produced, in this order, increasing pantothenic acid values for most of the tissues, particularly muscle tissues and more especially cooked meats. Tests indicated that the higher results obtained after pancreatic digestion were due, not to significant amounts of the vitamin in the enzyme preparation or to the liberation of bacterial growth-stimulating substances, but to increased liberation of the vitamin from the tissues. The small value obtained for pantothenic acid in the pancreatin was subtracted as a correction from all values obtained.

Liver (39-88 μ g. pantothenic acid per gram, fresh basis) and kidney (27-49 μ g.) of the various species were the richest of any of the tissues, while striated muscle 4-21 μ g.), heart (12-25 μ g.), lung, pancreas, brain, and spleen contained appreciable quantities. The pantothenic acid in the animal tissues occurred chiefly in combined form, since it was liberated most completely by digestion with pancreatin. There was a decrease of approximately 30-40 percent of the vitamin in the cooked or commercially processed samples tested.

A clinical method for the determination of ascorbic acid in blood plasma and urine, E. STORZ (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 9, pp. 1542-1545).—The method, described in detail as to apparatus, reagents, and procedure and developed with a view to increasing the ease and speed of plasma ascorbic acid determinations in serial analysis, is based upon the fact that oxidized 2, 6-dichlorophenolindophenol can be quantitatively extracted from acid solution with xylene. The metaphosphoric acid filtrate of the plasma, adjusted to proper pH, is allowed contact with the dye solution for the short time necessary for the reaction. The oxidized dye is then extracted into xylene and the layers separated by centrifuging. In xylene the dye, no longer subjected to an acid medium or to slowly reducing substances, is stable for hours. Because of this stability feature, as many of the samples as desired are treated with the dye and extracted, and when all are completed the color of the xylene layers is measured photoelectrically or by use of the visual colorimeter. The extraction of the oxidized dye from acid solution by xylene was shown to be quantitative, and Beer's law was found to be applicable to the xylene solution of the dye in the concentration range of dye

utilized in this test. The method is readily applied to urine, which is first treated with metaphosphoric acid and then filtered.

Hemoglobin estimation with undiluted reduced blood, G. BARKAN (*Jour. Lab. and Clin. Med.*, 26 (1941), No. 11, pp. 1823-1828, figs. 2).—The Sicca hemometer, described as to construction and standardization, was developed for application of a new method involving the use of blood without its being measured or diluted but reduced, hemolyzed, and stabilized by the addition of a trace of a reagent powder containing sodium hydrosulfite, saponin, oxalate, and sodium chloride. Some advantages of the new type of hemoglobinometer are noted as follows: "(1) The use of undiluted blood eliminates the sources of error involved in diluting. The handling of the Sicca hemometer is very simple and needs no particular training. (2) The use for colorimetry of acid hematin, repeatedly criticized in earlier work, is abandoned in favor of the color of reduced blood. The latter is stable and independent of time, the errors due to inadequate time for reading being eliminated. (3) The use of constant glass standard and constant electric light in connection with correct filters allows observations with great optical contrast, eliminates the effects of voltage variations and plasma color (icteric blood), and decreases the personal equation to a minimum. (4) The dispersion of repeated readings with the same or with different Sicca hemometers is small, i. e., the reproducibility is particularly good. (5) Spare parts can be used without new standardization."

Determination of nickel and copper chromates and nickel, copper, and magnesium arsenates in treated wood, R. H. BAECHLER and P. SERVATIS. (U. S. D. A. coop. Univ. Wis.). (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 19-23).—Oxidation of the organic components of the sample was found best accomplished by means of a sulfuric-nitric-perchloric acid mixture. Dry ashing, though requiring less attention, was slower and could not be used when arsenic was to be determined. Adaptations of customary methods suitable for the separation and determination in the wood sample digests of copper and chromium, copper and arsenic, nickel and chromium, nickel and arsenic, and magnesium and arsenic are described in working detail.

Relative toxicity of materials recommended for slime control, J. W. APPLING and B. W. SHEMA (*Paper Mill News*, 65 (1942), No. 35, pp. 14, 16).—A number of chemicals on the market have been recommended for slime control, and the results of tests by the flask method with eight materials are here reported. *Aerobacter aerogenes*, frequently associated with slime development in paper mills, was the test organism, and the petri dish and flask methods for assaying the disinfectants were employed. The latter method proved most promising, and it is believed that a much better correlation between laboratory tests and mill runs will follow from the application of the relative toxicity values presented.

Cottonseed protein for adhesives, chemical studies, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, p. 3).—Attention has been given to improving the methods of extraction and purification, obtaining manufacturing cost, and improving methods for using the protein as an adhesive for plywood. Some preliminary tests made on plywood glued with cottonseed protein are promising. Work on the determination of calcium and phosphorus in turnip greens is noted under the same title.

Effect of time and temperature on sulfuring on absorption and retention of sulfur dioxide by fruits, C. D. FISHER, E. M. MEAK, and J. D. LONG. (Calif. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), Nos. 6, pp. 175-176, fig. 1; 7, pp. 199-200, 217, 219, figs. 3; 8, pp. 237-238, fig. 1).—A survey of sulfuring houses in operation in California showed that temperatures

adjacent to fruit during sulfuring for drying varied considerably with the conditions of sulfuring, locality, and season. Since there was some indication, but not full agreement among investigators, that the high temperatures favored SO_2 retention, this problem was investigated because there appeared also to be a relation between SO_2 retention and color retention in the dried fruit upon storage. The present paper describes the sulfuring experiments in which temperature and SO_2 concentration were controlled in the tests with various fruits, pretreated and dried according to standard commercial practices, and stored after drying. The results, discussed for the individual fruits, showed that cut fruit (apricots, peaches, and pears) as a rule absorbed less SO_2 during sulfuring, but retained more during storage when sulfured at a relatively high temperature, such as 120°F . The extent of the temperature effect varied with time, SO_2 concentration, nature of the fruit, and locality. When whole fruits (grapes and figs) were sulfured at 120° , they absorbed, and retained as well, more SO_2 than when sulfured at 70° . Prolonged, high-temperature sulfuring treatments tended to cause the cut fruit to bleed, become mushy, and stick to the drying trays. Frequently, the cut fruits sulfured at 120° yielded more slabs but retained a better color and more SO_2 for a longer period of time than when sulfured at 70° . The retention of color, however, also varied with other conditions, such as variety or drying climate.

Pasteurization of pickle products, J. L. ETCHells and I. D. JONES. (U. S. D. A. and N. C. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 11, pp. 330-332).—This paper presents a discussion dealing with the various aspects of pasteurization for the preservation of pickle products. Attention is called to the fact that pasteurization is valuable not only in the processing of unfermented and partially fermented products, but also in the preservation of genuine dills. "It has been demonstrated that a uniform pasteurization procedure, such as 165°F . for 15 min. followed by prompt cooling, can be adopted by packers for the manufacture of high-quality pasteurized pickle products of all types."

Vegetable juices, 1942 model, G. L. MARSH. (Univ. Calif.). (*Canner*, 95 (1942), Nos. 9, pp. 7-8, 12-13; 10, pp. 15-16).—This discussion indicates, first, how the present practices of preparing most vegetable juices result in loss of flavor and of food value. Specific reference is made to (1) the removal of vitamin A as the juice obtained by pressing passes through a column of vegetable pulp, (2) partial loss of the water-soluble vitamins in the blanching process, (3) further destruction of these by heat in the autoclaving process, and (4) loss of ascorbic acid through oxidation due to the presence of air and failure to destroy the ascorbic acid oxidase by flash heating. Methods recommended for decreasing these losses involve redesign of equipment and introduction of new devices, including (1) extractors, permitting continuous and rapid handling of the vegetable with incorporation of the minimum of air in the juice, (2) deaerators, for removal of dissolved or incorporated air, and (3) flash pasteurizers for high-temperature, short-time heating to effect pasteurization and enzyme destruction, followed by rapid cooling. For the latter process, the utilization of devices to speed the rate of heat exchange is recommended in order to reduce the holding time; since the high temperatures (240°F . or higher) required are detrimental to flavor and color, it is further recommended that the vegetable juice be acidified to a point which would allow the use of lower temperatures (195° - 212°). Acidification problems are discussed with regard to choice of acid, amounts needed as influenced by the initial pH and the buffering capacity of the juice, and consumer acceptability of a sour product.

The preparation and processing of peach, pear, and plum juices, E. A. BEAVENS and H. G. BEATTIE. (N. Y. State Expt. Sta. coop. U. S. D. A.). (*Canner*, 94 (1942), No. 21, pp. 15-20).—Cooperative studies led to the development of methods, which are here described, for the preparation and processing of peach, pear, and plum juices of the pulpy type. Careful selection of fruits with regard to variety and proper stage of maturity were the most important factors in obtaining satisfactory juices. Of the peach varieties tested, J. H. Hale and Elberta were the most satisfactory; of the pears, Vermont Beauty and Anjou; and of the plums, the Hungarian, German, and Italian prunes were most satisfactory for the production of red-colored juices, while the Yellow Egg and Reine Claude plums gave the best yellow-colored juices. Pulpy juices were made more palatable by blending with pressed juices from the same fruit or with juices from other fruits, such as the apple, or by diluting with thin sugar sirups. The use of sugar sirup was particularly desirable in the case of certain plum juices, which were sour or astringent, and in the case of peach juices, which were markedly improved in flavor by the addition of the sugar. Peach juices were handled as rapidly as possible in order to prevent browning and oxidation. Red plum juices in which the color darkened through the browning of the suspended pulp were improved by clarification, which removed the muddy appearance. The best pulpy juices were prepared by hot pressing, deaeration (peaches and pears), and flash pasteurization at temperatures of 170°-185° F., followed by packing in cans or bottles and cooling rapidly.

An improved orange marmalade of high vitamin C content, A. SEDKY, C. R. FELLERS, and W. B. ESSELEN, JR. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 6, pp. 170-172, 185, 189).—The method described for making an orange marmalade high in vitamin C content and excellent in flavor involved the use of orange peel cooked separately in 0.1-0.2 percent citric acid solution. The use of this peel protected the juice from the detrimental effect of prolonged cooking and thus permitted the retention of color, flavor, and vitamin C content. By using a sufficient amount of such peel, the addition of pectin could be eliminated. A 1½:1 ratio of sugar to juice was the most satisfactory, and in this case 1.3 gm. of pectin for each 100 gm. of sugar seemed to be satisfactory. The use of dextrose up to 25 percent as part of the added sugar lessened the sweetness of the product and contributed to the flavor, but resulted in a marmalade of firmer texture. About 80 percent of the ascorbic acid of the juice was retained in the marmalade, and analyses of the product described showed it to contain from 17.5 to 29.2 mg. of ascorbic acid per 100 gm. as compared with commercial marmalades, which were found to contain from 2.1 to 6.3 mg. per 100 gm. A formula which proved very satisfactory is presented for the use of an orange concentrate in making the marmalade. With the use of this concentrate the time of preparation was reduced, thus allowing a greater protection of the vitamin C content and color.

Fruit concentrates and their use, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 6, pp. 165-169, 187, 190, fig. 1).—Fruit concentrates are usually prepared industrially from fruit juices by boiling off and condensing the excess water under vacuum, but by this process flavor and aroma are lost in the vapors and although there are various ways of recovering the volatile flavor constituents, they are not in general use. A continuous vacuum concentrator, consisting of an inclined pyrex tube jacketed with a larger glass tube through which hot water or steam was circulated under low pressure, gave satisfactory results in laboratory trials and

offered possibilities for adaptation on a commercial scale. A vacuum of 29 in. or higher was essential for good results with fresh fruit juices. Concentrating by freezing the juice to a slush of ice and juice, followed by separating the ice and concentrate by centrifuging or draining, gave concentrates of rich flavor and aroma. Laboratory experiments indicated that the procedure would be practicable. Concentration of the juice to only 50°-55° Brix (instead of the usual 70°-72°), flash pasteurization in bottles or cans sealed and stored at 32° F., or better still, freezing storage at temperatures below 15° are recommended procedures for retaining flavor, aroma, and color of stored concentrates.

Packaging dehydrated fruits and vegetables, G. J. HUCKER and J. R. SANBORN (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, pp. 1, 7).—The authors report briefly upon the progress made and the difficulties yet to be met in the protection of dehydrated foods against bacterial contamination and penetration of moisture from either temperate or tropical atmospheres, as well as against loss of an inert atmosphere when the last-named protection is needed, without the use either of tins, for which sufficient material is not likely to be available for the present, or of glass containers, which are objectionably heavy and probably cannot be produced in adequate volume. Lamination of sheets of variously treated papers, cellophane, sheet plastics, vegetable parchments, etc., may give better protection by combining the qualities of each of the different types of materials used in the lamination. Most of the closures at present in use are not sufficiently moisture proof. The most severe tests require the packages to withstand 100° F. in a relative humidity of more than 80 percent for a period of 6 mo. Dehydrated foods stored under these conditions are being examined at regular intervals for their microbiological content, moisture and vitamin content, and palatability.

What's known today about dehydrating vegetables, W. V. CRUESS and E. M. MRAK. (Calif. Expt. Sta.). (*Food Indus.*, 14 (1942), Nos. 1, pp. 57-60, figs. 2; 2, pp. 41-43, 96-97, figs. 3; 3, pp. 48-49, 96, figs. 2; 4, pp. 57-59, 98, figs. 2; 5, pp. 43-45, 98-99, fig. 1).—This series of articles on the dehydration of vegetables is largely a compilation of present information. General consideration is given to properties of satisfactorily dehydrated vegetables, adaptability of various vegetables to dehydration, and sun-drying v. dehydration. Coverage, in some detail, is given to the following topics: Preparation for drying, including washing, peeling, subdividing, trays and traying, blanching, and waste disposal; dehydrators of natural draft, forced-draft tunnel, air-blast compartment, air-blast combination compartment and tunnel, air blast continuous, and vacuum-drier types; principles of dehydration with reference to functions of air, role of heat, heat and air requirements, air velocity, air recirculation, the parallel-current system, effect of temperature on drying rate, critical temperature, relative humidity, case hardening, moisture content of dehydrated vegetables, and judging of finishing point; specific directions for the preparation and dehydration of 35 vegetable products; yields; storage from the standpoint of insect infestation, fumigation, cold storage, molding, and vitamin losses; packing with reference to cartons, cans, glass containers, and "bricks" and "sausages"; use of dehydrated vegetables, with notes on refreshing and cooking; and laboratory examination involving moisture determination, refreshing and cooking tests, scoring, and vitamin assay. A selected list of references is given.

The dehydration of vegetables, W. V. CRUESS and E. M. MRAK. (Calif. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), Nos. 7, pp. 201-204; 8, pp. 241-242; 9, pp. 269-272; 10, pp. 302-307; 11, pp. 337-340).—Essentially noted above.

The dehydration of vegetables, E. M. MRAK and W. V. CRUESS. (Calif. Expt. Sta.). ([*War Dept. U. S.*], *Q. M. Corps, Spec. Subsist. Bul.*, 1941, pp. [2]+V+67, figs. 10).—This bulletin contains essentially the same material as that noted in the series of articles above, but includes additional illustrations and a tabular summarization of the procedures for preparing and dehydrating the various vegetables.

Factors affecting the quality of frozen foods, H. CARLTON. (Univ. Tenn.). (*Refrig. Engin.*, 43 (1942), No. 4, pp. 205-208, 245, figs. 2).—This survey points out that the rules for production of high-quality frozen foods apply equally to the commercial quick-frozen food industry and to freezer locker operations. High-quality fresh vegetables are necessary for high quality in the frozen pack, and this necessitates that the packing plant be located in a region where such fresh products may be raised. The varieties selected should be those that produce, in the given region, good yield with high quality, that suit the taste of the particular market, and, in the case of commercial plants, are suitable for specific uses and for machine harvesting and mass handling. Other points stressed are the importance of harvesting at proper and uniform maturity, of handling promptly, of maintaining excellent sanitation, and of proper packaging and close wrapping to prevent loss of moisture and flavor.

AGRICULTURAL METEOROLOGY

Average precipitation contrasts in the United States, S. S. VISHER (*Sci. Mo.*, 55 (1942), No. 5, pp. 446-452, figs. 8).—The range in average annual precipitation among the long-established Weather Bureau stations is found to be from 1.5 in. for one in Death Valley, Calif., to 128.6 in. for one near Gray's Harbor, Wash. A score of other stations with records of more than 20 yr. have annual averages of less than 4 in. or over 100 in. The dry ones are in the Southwest and the wet ones in western Washington and western Oregon. The greatest average east of the coast ranges is recorded at two stations in the mountains of western North Carolina, which have long-time averages of about 83 in. The accompanying maps and discussion show the average precipitation annually, during the warm season (April-September), spring, summer, fall, and winter, and the average annual snowfall and number of days with thunderstorms. These pronounced regional contrasts naturally have profound influences on plants, animals, and mankind.

Hydrologic studies at the West Tarkio Creek Demonstration Project SOS-Ia-1, Shenandoah, Iowa: Compilation of rainfall, run-off, and soil loss from the Tarkio River and West Tarkio Creek watersheds, 1934-40, W. D. PORTER and S. K. LOVE (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, SOS-TP-42, pp. [413], pls. 44).—The hydrologic and land use data here presented are those collected at the West Tarkio Creek and Tarkio River watersheds during the period 1934-40.

Some notes on the effects of the incidence of rain on the distribution of rainfall over the surface of unlevel ground, H. G. FOURCADE (*Roy. Soc. So. Africa, Trans.*, 29 (1942), pt. 3, pp. 235-254, figs. 6).—Factors governing the catch of rain over a given area are shown to be the vertical rainfall, inclination of the rain, its direction, and the slope and aspect of the ground. The mathematical relations among these factors are deduced. Methods of measuring the inclination and direction of rain are discussed, suitable gages proposed, and application is made to the determination of the true equivalent rainfall over a catchment area. Neglect of the influence of inclination of rain on the equivalent rainfall is shown to have been a fruitful source of error in interpreting some recorded

catches. An addendum discusses studies along these lines being undertaken by C. L. Wicht.

On synchronous variations of pressure in tropical regions, S. FROLOW (*Amer. Met. Soc. Bul.*, 23 (1942), No. 6, pp. 239-254, figs. 5).—Study of the transitory components of the pressure-variation field is especially promising for weather services charged with forecasting in tropical regions. The conclusions from the present study, based on about 30 tropical barometer records, are as follows: For the whole network, in 70 to 80 percent of the cases the 72-hr. pressure difference variations represent very marked similarities with the variation at Fort-de-France, Martinique. Conversely, the variation at Fort-de-France denotes a periodicity, the similarity of which extends to the other stations. Within the limits of the time-scale used, the centers of the variations of 72-hr. pressure differences do not move geographically. These variations are, therefore, synchronous. Over such a large tropical region these variations constitute a common factor in the field of pressure-variation. The theoretical and practical consequences of these conclusions should be investigated, especially as to the origin of the synchronous variations and the usefulness of the isallobaric method for weather forecasting in the Tropics.

Agricultural meteorology, J. W. HOPKINS (*Canada Natl. Res. Council Rev. Activ.*, 1941, pp. 25-26).—Based on accumulated records, a study was made to determine the climatological characteristics (April-September, 1890-1937) at Winnipeg, Man.; Swift Current, Sask.; and Edmonton, Alta. The seasonal incidence of rainy and rainless periods was also included, lengthy rainless periods being an important factor in initiating soil erosion by wind action.

Studies in Guatemalan meteorology.—I, The climates of southwest Guatemala, F. W. MCBRYDE. (Ohio State Univ.). (*Amer. Met. Soc. Bul.*, 23 (1942), No. 6, pp. 254-263).

SOILS—FERTILIZERS

Introduccion al estudio de los suelos [Introduction to the study of soils], A. GONZALEZ GALLARDO (*Mexico: Banco Nac. Credito Agr., S. A.*, 1941, pp. [1] + VII + 484, [pls. 43, figs. 31, maps 2]).—This is a textbook of edaphology, having special reference to the soils of Mexico. It is noted that no modern treatise on this subject has previously existed in the Spanish language, still less a work concerned especially with Mexican soils. The book contains previously unpublished information concerning Mexican soils derived in large measure from the completed portion of a general investigation of the agricultural resources of Mexico undertaken by the Mexican National Agricultural Loan Bank. The chapters deal with the formation of the soil, physical characteristics, water content, chemical characteristics, climatic bases of soil distribution, the great soil groups of the world, the Mexican soil map, and agrologic studies.

[Soil and fertilizer investigations by the Mississippi Station] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, pp. 1, 3).—Recommendations concerning the use of available substitute fertilizer mixtures in replacement of the formulas withdrawn by war restrictions are made by C. Dorman under the heading 4-8-4 and 4-8-8 Only Grades Complete Fertilizer for 1943, Nitrogen Limited by War. Boron and phosphate experiments and a vetch fertilizer test are noted by the same author under the heading Fertilizers and Soils for Crop Production.

[Soil investigations by the New York State Station] (*New York State Sta. Rpt.* 1942, pp. 23-24, 63-64).—Progress is reported on legume inoculant inspection work, investigations of synthetic soil as a bacteriological culture medium, the pigments produced by certain soil bacteria, and fundamental studies on methods of identifying the various types of micro-organisms that occur in soil,

air, dairy, and other food products. Soil conservation investigations concerned included meteorological data, soil and water losses under different conditions, the effect of texture of erosion material on organic matter content, and the effect of depth of topsoil and percentage of organic matter and nitrogen of soil in four Corn Belt States.

[Soil Survey Reports, 1936 and 1938 Series] (*U. S. Dept. Agr., Plant Indus. [Soil Survey Rpts.], Ser. 1936, No. 18, pp. 65, pls. 2, fig. 1, map 1; 1938, No. 2, pp. 37, fig. 1, map 1*).—These surveys were made in cooperation with the Rhode Island and the North Carolina Experiment Stations et al., respectively: 1936, No. 18, Newport and Bristol Counties, R. I., A. E. Shearin et al.; and 1938, No. 2, Warren County, N. C., W. A. Davis et al.

The comparative physical constitution of water-stable granules and of the originating soil, R. B. ALDERFER and F. G. MERKLE (Pa. Expt. Sta. and U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 2, pp. 105-113).—Noting that Sideri (E. S. R., 80, p. 304) and others sought, by the use of selected organic and inorganic constituents, to explain the chemical and physical mechanisms of structure formation, the authors state as their own purpose to determine the differences in mechanical analyses between water-stable aggregates and the soil from which they are formed. Organic matter both in the whole soil and in the aggregates was determined by Tiurin's modification of Schollenberger's method (E. S. R., 65, p. 504). Water-stable granules were separated from the A₁ horizon of 11 Pennsylvania soil types represented by 15 forested and cultivated areas. A complete mechanical and organic matter analysis was made of the "hand-picked" granules and of the whole soil.

Most of the large stable granules contained a greater percentage of organic matter and clay than did the whole soil from which they were derived. The increase in clay content of the granules was not offset by an equivalent decrease in any other single particle size fraction. The percentage of silt, sand, or gravel in the granules may be thus decreased. The stability index, a measure of granule stability, was found closely correlated with the organic content and the clay content of the soil. The probable permeability was closely correlated with organic content but bore no significant relationship to the clay content. Cultivation generally dispersed existing granules, and the dispersed clay reaggregated to form granules higher in clay and organic content than the whole soil from which they were formed. The granules in young soil profiles seemed to be formed and stabilized largely through the action of organic and biological influences. Those in poorly drained profiles were formed chiefly by disintegration of more massive structural units and stabilized by the action of organic matter, whereas those in well-drained mature profiles, provided the latter contained easily dispersible clay, had granules formed by dispersion and reaggregation of the clay and the organic matter. The granule genesis in the Hagerstown, Montalto, and Chester series may have been effected by the cementing action of hydrated iron oxides when the soil was developing. These granules were found in the forest soil but are gradually dispersed when the soils are brought under cultivation.

Stability of clay soils, E. C. CHILDS (*Soil Sci.*, 53 (1942), No. 2, pp. 79-92, figs. 6).—The method of assessing soil stability by means of moisture characteristics taken before and after artificial weathering was applied to Upper, Middle, and Lower Lias clays. The results are discussed, with particular reference to mole drainage, and it is shown that the Upper and Lower Lias are almost as stable as a Gault soil known to be suitable mole-draining land. Some known drain failures are discussed. The evidence thus far collected is considered, however, to be "insufficient to allow us safely to interpret stability curves in borderline cases." A deep sample of London clay is shown to behave peculiarly in that it withstands

the stresses of rapid wetting from the air-dry state and then disintegrates progressively over a period of days while undisturbed in the saturated state. The subsolling of unstable clay soils was found to require as careful consideration as does mole draining.

Structure of a Dunkirk silty clay loam in relation to pF moisture measurements, V. C. JAMISON (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 307-321, figs. 8).—The relation of soil structure to successful crop production is discussed. Mention is made of the different units for expressing structural conditions of the soil. Using Dunkirk silty clay loam soil, measurements were made of pore size distribution in an attempt to determine the application of the pore size distribution method to the study of structural conditions in field soils. Pore size distribution measurements were found to be helpful in picturing the soil as it is at the time of examination for the particular spot being studied. The method may be used to follow structural changes if sufficient samples are taken and the results analyzed statistically. With the Dunkirk silty clay loam a general increase in pore space was associated with structural improvement.

Structure of some organic soils and soil mixtures as shown by means of pF moisture studies, V. C. JAMISON (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 393-404, figs. 7).—Some of the effects on physical and chemical properties of the soil brought about through the addition of organic amendments are discussed briefly. The condition of structure was measured for several organic soils and mixtures of organic and mineral soils by means of pore size distribution studies according to a method described in the article noted above. Pore size distribution was found to be more useful and gave a better picture of soil structure than the commonly used dry weight basis. All organic soils studied, though greatly different in several properties, showed the greatest frequency of pores between pF 1.0 and 3.0, with a smaller second maximum between pF 4 and 5. Adding peats to mineral soils caused the greatest change in pF moisture relations at the lower of the two above ranges.

Laboratory study of the response of 2- and 4-electrode plaster of paris blocks as soil-moisture content indicators, A. B. C. ANDERSON and N. E. EDLEFSEN. (*Calif. Expt. Sta.*). (*Soil Sci.*, 53 (1942), No. 6, pp. 413-428, figs. 7).—A laboratory investigation showed that the two- (E. S. R., 83, p. 307) and four-electrode (E. S. R., 86, p. 594) plaster of paris blocks can be calibrated at all moisture contents by placing them in a soil surrounded by the roots of actively transpiring plants and then observing the relation between soil moisture content and block resistance. Because of the very great lag in response to the value of the moisture content of soil in which no plants are growing, the blocks cannot be calibrated satisfactorily in the absence of roots of actively transpiring plants at the lower ranges of soil moisture content. Both the two- and four-electrode blocks, the preparation of which is described, under like soil moisture contents in the soil tested always had a like resistance at all soil moisture contents extending from the permanent wilting percentage to almost three times the moisture equivalent. Over the entire range of moisture readily available to plants, both the two- and four-electrode blocks served as dependable and practical indicators of the soil moisture content of any locality in a body of soil in which the blocks could be buried and in which the changes in soil moisture content were caused by the removal of the moisture by the roots of actively transpiring plants. As a soil moisture content indicator, the two-electrode is better than the four-electrode block because of the simplicity in the manufacture and in the measurement of the resistance. The two-electrode

resistance of a plaster of paris block was found not very sensitive to variations in the separation of the two electrodes in the midplane of the block.

The electrical capacity of the 2-electrode plaster of paris block as an indicator of soil-moisture content, A. B. C. ANDERSON and N. E. EDLEFSEN. (Calif. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 1, pp. 35-46, figs. 5).—Laboratory and field investigations on the use of electrical capacity of the two-electrode plaster of paris block as an indicator of soil moisture content are reported. The procedure in determining the electrical capacity was similar to that of determining the electrical resistance of the plaster of paris blocks, as described above and by Bouyoucos and Mick (E. S. R., 83, p. 307).

The electrical capacity of a plaster of paris block with its electrodes 2 cm. apart was found not to be changed appreciably by variation of as much as 3 mm. in the separation of the two electrodes in the midplane of the block. In comparison to the electrical resistance, the electrical capacity of the blocks appeared relatively unaffected by changes in the concentration of the soil solution. With decrease of soil moisture content, the electrical capacity of the blocks began to drop from a rather high value (approximately 0.070 $\mu\text{f.}$) at about the moisture equivalent, approaching a relatively constant value (around 0.0003 $\mu\text{f.}$, a little above the permanent wilting percentage of the soil. The dependence of the electrical capacity of the blocks on the soil moisture content showed good reproducibility and an absence of lag in response of the blocks to changes of soil moisture content. The results recorded indicate that the electrical capacity of the plaster of paris block will serve, over the entire range of moisture content readily available to plants, as a practical indicator of the soil moisture content in a body of soil where the blocks can be buried and where the changes in soil moisture content are caused by the removal of the moisture by the roots of actively transpiring plants.

Chemical and physical properties of some of the important alluvial soils of the Mississippi drainage basin, R. S. HOLMES and W. E. HEARN (*U. S. Dept. Agr., Tech. Bul. 833* (1942), pp. 82, figs. 6).—The alluvial soils investigated in the Mississippi drainage area include 11 profiles from the lowlands, 12 from the western tributaries, 6 from the eastern tributaries, soil material from a 100-ft. bored well in the Mississippi alluvium, material from the channel of the river at its mouth, and sedimentary material from the Gulf of Mexico. Descriptions are given of the soil profiles and of other samples, including location, drainage, texture, consistency, and color. Laboratory determinations include mechanical and chemical analyses of the soils, pH values, chemical analyses of the colloids, mineralogical determinations on certain colloidal material, and determinations of certain minor elements on a few of the soils. The chemical composition of the nonclay material is estimated.

The mechanical analyses indicate that the greater part of the coarser material is not carried long distances from its source. The alluvial soils of the lower Mississippi River are composed almost wholly of varying quantities of silt and clay. The chemical analyses, as well as the mechanical analyses of the soils, show little evidence of profile development in place. Variations in drainage, however, have produced differences in contents of calcium and magnesium. The chemical composition of alluvial soils derived from various geological areas reflects, in general, the differences in their geological material as well as the difference in the altered composition of the soils as they developed in the areas made up of these materials. The chemical composition of the colloids of the soils of the lower Mississippi Delta are essentially similar. There are essential differences in the chemical composition of the soils of the eastern and western tributaries which drain the Great Plains. The differences are most pronounced

in the major constituents of the chemical composition of the colloids. The soils and geological material of the Interior Highlands are more of the nature of the eastern tributaries.

The composition of the soils and the river water of the eastern and western drainage areas of the Mississippi show the influence of unequal distribution of rainfall over the two areas. The chemical composition of the soils and colloids of the Mississippi lowlands shows definitely that the major portion of this material is derived from the eastern slopes of the Rocky Mountains and the Great Plains area to the east of them. This is evidenced by the similarity of the composition of the colloids of the Mississippi alluvium and by the data reviewed pertaining to the silt content of the Missouri and the Ohio Rivers.

The productivity of most of these alluvial soils is in harmony with various features of their chemical composition. The chemical features include the relatively high content of bases, phosphorus, and organic matter. These soils are derived from widely separate and diversified geological sources. They apparently contain all the elements essential to plant growth. Of the minor elements, zinc, boron, arsenic, and selenium were found in representative soils of the Mississippi River.

Morphology and composition of some soils of the Miami family and the Miami catena, I. C. BROWN and J. THORP (*U. S. Dept. Agr., Tech. Bul. 834* (1942), pp. 55, fig. 1).—The morphological, chemical, and physical characteristics of representative soils of the Miami family and of the Miami catena have been studied. The parent material, climate, and vegetation of the soils are essentially the same. The soils of the Miami family have similar local drainage conditions, but those of the Miami catena have not. A short discussion of the general system of soil classification is accompanied by tables and a figure showing the relationships of the members of the Miami family and the Miami catena. The description of each soil profile examined is preceded by a description of the landscape, the parent rock, and the drainage. The laboratory determinations include pH values, the mechanical and chemical analyses of the soils, and the chemical analyses of their colloids. The data are arranged in tables and discussed with reference to their morphology and the influence of local conditions on the formation of the soils. This is followed by a general discussion of the consequences of local drainage on soil development. It has been shown that iron has been appreciably fractionated and illuviated in the upper horizons of the soil. Lateral subsurface drainage has increased the iron content of the dark-colored soils. Small quantities of carbon dioxide in the leached acid parts of the soils is largely confined to unaltered particles of dolomitic limestone. It is apparent that the organic matter of the soils and colloids has been fractionated more than the inorganic portion. It has been shown that the compositions of this group of soils are essentially alike, largely because of the similarity of climate, vegetation, and parent material. The causes of certain morphological features of the soils are clearly indicated by the analytical data; the general classification of the soils is not. It is suggested that the determination of the soil minerals and certain exchange data may assist materially in explaining the causes of marked differences in the morphology of the soils of the Miami catena.

Analyses and profile notes of some Laterite soils and soils with iron concretions of Thailand, R. L. PENDLETON and S. SHARASUVANA (*Soil Sci.*, 54 (1942), No. 1, pp. 1-26, figs. 8).—Profile descriptions and chemical analyses of samples of Laterite soils and some related soils collected from many widely separated localities in Thailand are presented. "Laterite" is used in the strict original sense of an iron-oxide-rich, indurated, quarryable slaglike or pisolitic illuvial horizon developed in the soil profile. Laterite or other lateritic horizons

are easily distinguished in the field, and since Laterite soils are infertile the presence or absence of Laterite in a soil is an important criterion of soil character. Special emphasis is given to a prevailing confusion and to certain misconceptions regarding equatorial soils, especially with regard to the nature and manner of formation of Laterite and Laterite soils. Numerous and detailed observations and analytical data are recorded.

A biological reduction method for removing free iron oxides from soils and colloidal clays, L. E. ALLISON and G. D. SCARSETH. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 7, pp. 616-623, fig. 1).—Difficulties caused by the presence of free iron oxides in making soil studies involving mechanical analysis, mineralogical analysis, specific gravity separations, and phosphate fixation have long been recognized. In view of the known action of micro-organisms in dissolving iron compounds in nature, the investigations reported were undertaken to determine the solvent and reducing action on iron-bearing compounds in the soil and in colloidal suspensions which have a large surface area. The method is described in detail and was found to be of particular value as a teaching device for demonstrating the relationship between energy materials and important soil transformations.

Crop rotation as a factor in soil erosion control, J. R. CARREKER. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 6, pp. 190-192, figs. 2).—Work from 1930 to 1935 on several soil and water conservation experiment stations has shown that soil loss from corn in a rotation with close-growing crops was less than from corn after corn, and similar results were obtained with cotton. Recent work at the Southern Piedmont Experiment Station at Watkinsville, Ga., indicated that considerable reduction in soil loss and improvement in crop yields may be obtained by rotating cotton with other crops. Of special merit are (1) the 3-yr. rotation of cotton, oats-lespedeza, and lespedeza, and (2) the contour-balk system of cotton culture.

Effect of erosion on fertility changes in the Shelby loam profile, D. M. WHITT and C. L. W. SWANSON. (U. S. D. A. and Mo. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 6, pp. 283-298, figs. 4).—Shelby loam soil planted to different crops and under different systems of management is compared on the basis of 1-in. horizons with the same soil under continuous bluegrass for total exchange capacity, exchangeable calcium and magnesium, nitrogen and organic matter content, and pH. Exchange capacity, exchangeable bases, and base saturation were found to increase with depth, while organic matter and nitrogen content decreased with increase in depth. Fertility of the soil was maintained by a 3-yr. rotation of corn, wheat, clover-timothy with fertilizer and lime treatments. Rate of soil loss was small enough so that the harmful effects were counteracted by the incorporation of small increments of the subsoil. The clay added from the subsoil was removed in the surface runoff in such amounts as not to alter materially the texture of the soil. Additions of subsoil increased the amounts of exchangeable calcium and magnesium.

Farms the rains can't take, K. DAVIS and O. E. HAYS (*U. S. Dept. Agr., Misc. Pub. 394, rev.* (1942), pp. II+14, figs. 8).—This is a revision of the edition of August 1940 (E. S. R., 84, p. 300), including results from new work on the La Crosse, Wis., erosion and runoff control plats.

Tests on vegetated waterways, M. B. COX. (Coop. U. S. D. A.). (*Oklahoma Sta. Tech. Bul.* 15 (1942), pp. 23, figs. 10).—The rate of loss of soil from the test channels was dependent both upon the degree of looseness or openness of the soil at the time of the flow through the channel and upon the duration of flow and time between flows. Under like conditions of flow, ranging from 0.05- to 1.3-in. depth and for durations of from 30 to 60 min., blue grama was superior

to other grasses tested in preventing erosion in the channels. Bermuda and buffalo were approximately the same in erosion resistance, and weeping lovegrass (*Eragrostis curvula*) was the least effective. Bermuda appeared to withstand more soil loss from around the roots than any of the other grasses studied without being removed completely from the channels by the water. Under sustained high velocities (11 ft. per second) Bermuda was superior to the other grasses in protecting the channels from erosion.

The data indicate that Manning's "*n*" varies with several factors, including type and condition of the grass, slope of the channel, and the depth of the flow. Manning's "*n*" for long green Bermuda was found to approximate 0.06 at 0.9 ft. depth of flow and 4 percent slope, buffalo grass 0.04 at 0.5 ft. and 2 percent, blue grama 0.05 at 0.7 ft. and 4 percent, and weeping lovegrass 0.05 at 0.7 ft. and 4 percent. Smooth side walls appeared to have no appreciable effect when the bottom roughness is great as it is in grass channels. This appeared to be true for channels up to 1 ft. in depth and as narrow as 1 ft. Depth of flow (*D*) was substituted for hydraulic radius (in effect omitting the side walls from the wetted perimeter), and in this bulletin the discussion and computations have been confined to the Manning formula written as

$$V = \frac{1.486}{n} D^{2/3} S^{1/2}.$$

An inexpensive soil sterilizer, M. L. PETERSON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 7, pp. 674-676, fig. 1).—The equipment described in detail was developed to meet the needs of the Southern Great Plains Field Station at Woodward, Okla., for soil sterilization necessary in starting grass plants from seed in the greenhouse. The heating chamber is similar in principle to the waterless cooker and was constructed in the station shop at a cost of \$24.93 for materials. The unit has a capacity of 10 flats 15.5 in. wide by 23.5 in. long and 4 in. deep.

Preparation and use of artificial manures, K. J. KUCINSKI (*Massachusetts Sta. Bul.* 395 (1942), pp. 12, figs. 2).—Corn stover, mixed deciduous leaves, oat straw, and mixed leaves and garbage were used in making artificial manure. The author discusses methods of preparation for small- and large-scale amounts. Data are presented on the rate of decomposition, heat and moisture relationships, chemical analyses of the products, and volume and appearance of the finished product, as well as results from pot and field experiments. Both chemical and vegetation tests showed that when Cyanamid or ammonium sulfate was used in the preparation of manure from corn stover, oat straw, or leaves and garbage, a finished product resembling well-rotted farmyard manure was obtained. Leaves used alone decomposed to form artificial manure very slowly, while corn stover decomposed most rapidly.

Forest soil studies.—II, Changes in microflora and chemical composition of decomposing tree leaves, E. A. MARTEN and G. G. POHLMAN. (W. Va. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 1, pp. 67-77, figs. 4).—Ground leaf samples from table mountain pine, beech, red maple, red oak, yellow poplar, and black walnut trees were inoculated, in the second of these studies (E. S. R., 83, p. 25), with a soil suspension from a mixed forest stand and incubated for 32 weeks. Changes in flora and in chemical composition were noted.

The pH of all leaves increased during the incubation period. At the end of the incubation period the black walnut had the highest pH, followed in order by yellow poplar, beech, red oak, pine, and red maple. Rapidity of increases in bacterial numbers was associated with pH, the black walnut showing the most bacteria and red maple the least in the early stages of decomposition. Follow-

ing the initial increase in bacterial numbers and the decomposition of water-soluble material, there was little evidence of relationship between bacteria and reaction. Numbers of fungi increased rapidly in all samples regardless of pH. The types of micro-organisms were found to be the same regardless of the kind of leaf sample used. The early decomposition affected principally the water-soluble materials, whereas some decomposition of cellulose and lignin occurred in the later stages. The extent of lignin and cellulose decomposition appeared to be associated with pH, the higher rate of decomposition occurring at higher pH values. An increase in lignin content of red oak, yellow poplar, and red maple occurred during the first 8 weeks of the experiment. There appeared to be some relationship between lignin and excess base content.

Nitrogen losses from Alabama soils in lysimeters as influenced by various systems of green manure crop management, R. J. JONES. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 6, pp. 574-585, figs. 2).—Nitrate nitrogen leached from Decatur clay loam, Norfolk sandy loam, and Hartsells fine sandy loam was determined over a 4-yr. period with lysimeters under different systems of crop and soil management. Winter and summer legumes and sodium nitrate were used as sources of nitrogen. The influence of the soil treatment on crop yields and nitrogen recovery was determined by growing Sudan grass during the summer. Nitrogen loss from leaching was closely related to the texture of the soil, i. e., the nitrogen lost decreased as the clay content increased. Cropping reduced the amount of nitrogen that was leached. With sandy soils the amount of nitrogen leached increased as the percentage of nitrogen contained in the different materials increased. The growing of a winter cover crop following fall-turned legumes resulted in only a small nitrogen loss from leaching. The author concludes from the results that summer legumes should be turned in the spring on sandy soils, unless a winter cover crop is to be grown, that winter cover crops greatly reduce the loss of nitrogen by leaching, that the loss of nitrates is related to the texture of the soil, and that soils should not be left fallow during seasons of heavy rainfall.

Persistence of *Rhizobium japonicum* in soil, A. G. NORMAN. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, p. 499).—From a field experiment with soybeans under two levels of fertility to determine the effect of inoculation on yield, the author failed to find any significant difference in number of nodules between inoculated and uninoculated plats, although there was a difference in nodules present under the different levels of fertility, the greatest number being under the lower fertility level. Yields also failed to reveal any significant difference as a result of the inoculation. A further search of the land history revealed that in the season of 1917, immediately before this portion of the farm was taken over for experimental purposes, a crop of beans had been planted on the two ranges concerned. A sufficient number of organisms to produce satisfactory nodulation had thus been maintained in these soils for a period of 24 yr.

The influence of fertilizers and season on nonsymbiotic nitrogen fixation in Brookston and Bedford silt loams, J. L. ROBERTS and F. R. OLSON. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 7, pp. 624-627).—A higher content of soil nitrogen in fertilized Bedford silt loam in comparison with unfertilized was not found to be due to stimulated nonsymbiotic nitrogen fixation. Also the rate of nitrogen fixation in Bedford or Brookston silt loams was not affected by phosphatic or potassic fertilizers. Relatively few *Azotobacter* were found in the samples studied, and these could not be considered responsible for a significant part of the observed nitrogen fixation.

The *Azotobacter* plaque test as applied to the determination of phosphate deficiency in Idaho soils, W. V. HALVESEN and W. G. HOGE. (Idaho Expt.

Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 6, pp. 503-512).—The authors describe a modified *Azotobacter* plaque test which they state has several advantages over methods used by other investigators. The test was applied to 425 representative Idaho soils of which 17 percent were classified as not deficient, 83 percent ranged from slightly deficient to very deficient, and 66 percent ranked from moderately deficient to very deficient. Since most of these soils are representative productive soils of Idaho, it seems unlikely that 66 percent should logically be classified as moderately to very deficient in phosphorus. Yield data indicate that although the modified procedure overcomes certain difficulties, it is not a reliable indicator of phosphate deficiency in the Idaho soils studied, because *Azotobacter* growth indicated much greater response to phosphate when added to the plaque test than did field crops to normal fertilization with phosphate under field conditions.

Phosphate fixation in soil and its practical control, F. E. BEAR and S. J. TOOTH. (*N. J. Expt. Stas.*). (*Indus. and Engin. Chem.*, 34 (1942), No. 1, pp. 49-52, figs. 2).—Observations of agronomists on crop recovery of applied phosphate, location of applied phosphate within the soil profile, increased response to phosphate fertilization placed in bands, and small loss of phosphate in the drainage water are explained on the basis of phosphate fixation. The factors discussed in connection with phosphate fixation include microbiological consumption, chemical precipitation, and physicochemical adsorption. Fertilizer placement both in bands and below the zone affected by cultivation and summer drought are suggested for increasing the effectiveness of applied phosphate.

Field experiments with phosphate fertilizers, T. E. ODLAND and T. R. COX (*Rhode Island Sta. Bul.* 281 (1942), pp. 27, figs. 4).—Superphosphate, concentrated superphosphate, ground bone, basic slag, dicalcium phosphate, and rock phosphate are compared for the period 1926-39 in an experiment involving different phosphate carriers which was begun in 1894. Comparisons were made between rock phosphate and superphosphate on an equal phosphoric acid and an equal cost basis. The crops used consisted of potatoes, field corn, mixed hay, oats, barley, rape, and five vegetable crops.

Superphosphate, either as the ordinary grade or as concentrated, was the most efficient source, in general. Rock phosphate became too slowly available for most crops and cannot be considered a satisfactory source. Ground bone was found satisfactory for some crops, but was too slowly available for most crops, and the cost per unit is too high for general usage. Basic slag was a very satisfactory source, but the unit cost is considerably more than in superphosphate. Dicalcium phosphate was also satisfactory, but the cost per unit was somewhat higher than in superphosphate. If it can be obtained at the same cost per unit as superphosphate it should prove an economical source. The largest response to additional applications of phosphorus was obtained with cabbage, potatoes showed less response, and corn, oats, and mixed hay were intermediate. The authors conclude that considering the availability, cost per unit of effective phosphoric acid, and yields obtained, superphosphate, either as the ordinary grade or in concentrated form, is the most efficient source of phosphorus for fertilizer use in this region.

Plant culture and nitrification studies with sludge-acid superphosphate, B. E. BROWN, K. D. JACOB, and F. R. REID. (U. S. D. A.). (*Amer. Fert.*, 96 (1942), No. 7, pp. 5-6, 24, 26).—Acid-sludge from the refining of petroleum products is sometimes used in the manufacture of superphosphate, but in some cases there has developed a prejudice against the use of superphosphate made from the sulfuric acid sludge over that made from clear sulfuric acid. Greenhouse and laboratory tests were undertaken to determine whether there was any

basis for this prejudice. Sludge-acid superphosphate from four different sources was usually found to give results that were not inferior to those obtained from clear-acid superphosphate.

The authors also compared the different phosphates by means of nitrification studies on ammonium sulfate in soil cultures: Conversion of ammonium nitrogen to nitrate was practically the same over a 6-week period for both types of superphosphate.

Liming the land, F. E. BEAR (*New Jersey Stat. Cir.* 451 (1942), pp. [4]).—A popular discussion on the importance of using lime for obtaining maximum returns from soils. The question of how much and what type of lime to use is also discussed. In connection with the type of lime to use, the author points out that the purpose of this publication is not so much to deal with the form of lime as to encourage its greater use.

Manganese for oats and white beans in Michigan, R. L. COOK and C. E. MILLAR. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 224–227, figs. 6).—A manganese deficiency disease, grey speck of oats, has been found on alkaline mineral soils. Oats growing on alkaline sandy loam soils in Ingham, St. Clair, and Tuscola Counties were found to be seriously affected by the disorder. Applications of manganese sulfate greatly reduced the difficulty. Magnesium sulfate proved to be a partial corrective. During a survey of bean fields in 1940 for symptoms of potash deficiency, a discoloration of the bean leaves similar to that produced by a manganese deficiency was noted. Studies during 1941 showed the difficulty to be present in a number of fields and parts of fields. Soil tests showed the soils to be neutral or slightly alkaline where the deficiency symptoms were observed. Deficiency symptoms were found where an unusually vigorous growth of the bean vines occurred, which led to the conclusion that the luxuriant growth resulted in an exhaustion of the available supply of manganese. Manganese sulfate treatments resulted in a disappearance of the deficiency symptoms.

Wartime fertilizers for New Jersey (*New Jersey Stat. Cir.* 452 (1942), pp. [8]).—A condensed summary of recommendations concerning practices to increase the effectiveness of fertilizers and the kind of fertilizer to use for different crops. The problem of meeting the inorganic nitrogen shortage resulting from the use of nitrogen for war purposes is discussed under seven points indicating how nitrogen fertilizers can be used more effectively. Points to consider in getting the most from fertilizers in general are also presented. Recommendations of amounts and methods of application of fertilizers are given for various crops under different soil conditions.

Water solutions of ordinary mixed fertilizers for use in starting and side-dressing plants, A. L. PRINCE and V. A. TIEDJENS (*New Jersey Stat. Cir.* 449 (1942), pp. [4]).—Because of the difficulty of obtaining the high-analysis fertilizers originally proposed for use in water solutions for transplanting or side dressing, the suitability of ordinary mixed fertilizers was determined. The percentage of nitrogen, phosphorus, and potash soluble in water is given for 10 grades of mixed fertilizers. Most of the nitrogen and potash was soluble in water, while only from one-half to two-thirds of the phosphate was water-soluble. The authors conclude that ordinary commercial grades of mixed fertilizer can be used for making liquid fertilizers for transplanting and side dressing purposes.

Cottonseed meal ash as a fertilizer, P. CORREA DE MELLO (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 7, pp. 677–679).—Due to the loss of northern European markets for cottonseed meal, the price has declined to the point where the producers of the meal are beginning to use it as a fuel, which results in a fertilizer

material known as cottonseed meal ash. Cottonseed meal ash is made up in its entirety of phosphates, potash, magnesium, and calcium, with the amount of carbonate practically insignificant. Its value as a fertilizer has been confirmed by some of the producers in various ways, and, for this reason, the author decided to prepare this brief article in order to dispel whatever doubt exists as to its true value as a fertilizer. The author presents the following analysis as representing typical cottonseed meal ash: SiO_2 0.92 percent, P_2O_5 43.60, K_2O 32.70, MgO 17.80. and CaO 5.70 percent.

AGRICULTURAL BOTANY

Geographical guide to floras of the world: An annotated list with special reference to useful plants and common plant names.—Pt. 1, Africa, Australia, North America, South America, and Islands of the Atlantic, Pacific, and Indian Oceans, S. F. BLAKE and A. C. ATWOOD (*U. S. Dept. Agr., Misc. Pub. 401* (1942), pp. [1]+336).—The primary purpose of this book is usefulness rather than bibliographical completeness, since it aims to furnish an annotated catalog through 1939 of all the now useful floras and floristic works, including those in periodical literature that list or describe the complete vascular flora (or phanerogams only) of any region or locality, as well as all publications dealing on the same scale with useful and medicinal plants, vernacular names, and botanical bibliography. In general, only the later works referring to a given region or subject are included, and publications dealing with only a part of a flora are covered only when dealing with edible, medicinal, or woody plants. Occasional titles relating to weeds and poisonous species, chiefly from the botanical standpoint, are also included. Papers that are primarily ecological have been omitted unless they contain fairly complete lists of the plants of the areas discussed. It is believed that no list of the scope of this one has ever been published before, and this part covers all the world except Europe and Asia and the islands closely associated with them, comprising about 2,597 primary and 428 subsidiary titles. Author and geographical indexes are provided.

Vegetacion y riqueza forestal de la Provincia de Esmeraldas (Ecuador): Principales especies medicinales y forestales [Vegetation and forest wealth of the Province of Esmeraldas (Ecuador): Principal medicinal and forest species], M. ACOSTA SOLIS (*Maderil*, 14 (1942), No. 165, pp. 13-16, fig. 1).

The vegetation and natural resources of British Honduras, C. L. LUNDELL (*Chron. Bot.*, 7 (1942), No. 4, pp. 169-171, fig. 1).

The vegetation of Jamaica, F. SHREEVE (*Chron. Bot.*, 7 (1942), No. 4, pp. 164-166).

Two new dwarf species of Rubus from western China and Tibet and their Asiatic relatives, E. H. WALKER (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 2, pp. 260-262).

The ecology of turf grasses, J. C. CARROLL (*Ohio State Univ., Abs. Doctoral Diss.*, No. 36 (1941), pp. 29-33).—The author investigated the relative survival of a number of turf grasses when subjected to different degrees of drought and temperature, and the effect of nitrogenous fertilizers in conjunction with these other factors. Analyses were also made of the tissue for moisture, bound water, total nitrogen, and total sugars.

Researches on drought resistance in spring wheat.—II, The effect of time of day on survival of plants during exposure to artificial drought, C. B. KENWAY, H. B. PETO, and K. W. NEATBY (*Canad. Jour. Res.*, 20 (1942), No. 8, Sect. C, pp. 397-402).—Continuing these studies,¹ the time of day during which

tests were conducted was found to have a pronounced effect on the injury sustained by wheat plants subjected to artificial drought. When the day was divided into four 6-hr. periods, beginning at 6 a. m., the period from then to noon provided the most severe test. In 12-hr. and 18-hr. exposures, relatively severe damage to the plants was associated with the inclusion of the 6 a. m.-to-noon period.

Preliminary investigation of the rhythmic fluctuations in transpiration under constant environmental conditions, J. C. MONTERMOSE and A. R. DAVIS. (Univ. Calif.). (*Plant Physiol.*, 17 (1942), No. 3, pp. 473-480, figs. 2).—Leaves and cuttings of *Coleus blumei* rooted in the usual manner under normal greenhouse conditions exhibited rhythmic transpiration fluctuation when placed under constant environmental conditions of darkness, temperature, and humidity. The diurnal maximum and minimum fluctuations could be reversed by subjecting the plants to reversed light-dark periods using artificial light. There was a gradual transition of the maximum and minimum so that within 4 days a complete reversal was accomplished. There are 14 references.

Root modifications induced in *Zea mays* seedlings by irradiating dry seeds with soft X-rays, G. F. SMITH and H. KERSTEN (*Plant Physiol.*, 17 (1942), No. 3, pp. 455-464, figs. 19).—External and histological modifications occurring in the primary roots of corn seedlings grown from X-rayed seeds are described and illustrated. See also a previous note (E. S. R., 85, p. 745).

Tree growth and the environmental complex: A critique of "ring" growth studies with suggestions for future research, A. W. SAMPSON and W. S. GLOCK. (Univ. Calif. et al.). (*Jour. Forestry*, 40 (1942), No. 8, pp. 614-620).—This conference report (August 1941) presents the views of a group of specialists on the formation and interpretation of "tree rings." Much emphasis is placed on the complexity of the environmental factors influencing tree growth and on the biometric difficulties in attempting to correlate tree growth with rainfall. It was agreed that extensive experimental studies under controlled conditions would be desirable, and that the cooperation of physiologists, ecologists, climatologists, soil scientists, etc., is essential to a determination of the effects of the various environmental factors on growth.

Looking into a banana "tree": Structure and growth of the world's largest herb revealed, H. W. RICKETT (*Jour. N. Y. Bot. Gard.*, 43 (1942), No. 510, Sect. 1, pp. 141-148, figs. 5).

Growth and development of white poppy on varying daylength, N. A. KHLEBNIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 32 (1941), No. 7, pp. 503-504).—In experiments reported with two subspecies (not specified) of *Papaver somniferum*, the growth rate and development were deeply influenced by day length. The form from Tarbagatai (Chuguchak) possessed a long-day habit whereas the one from Tien-Shan proved more plastic, easily tolerating a short photoperiod.

Studies in the effects of prolonged rotation of plants on a horizontal klinostat.—III, **Physiological reactions in the hypocotyl of *Lupinus albus***, E. D. BRAIN (*New Phytol.*, 41 (1942), No. 2, pp. 81-90, fig. 1).—Geotropic response, pH of the cell sap, suction-pressure value of the cell sap, extensibility of the cell walls, and growth-substance distribution were examined in white lupine hypocotyls grown on a horizontal klinostat, and the results are presented in detail. The evidence indicates that differential growth-substance distribution is a fundamental process in geotropic response and induces greater extensibility of the cell walls receiving the increased growth-substance supply.

¹ *Canad. Jour. Res.*, 17 (1939), No. 8, Sect. C, pp. 294-296, figs. 2.

On the causes of regeneration after longitudinal splits, R. SNOW (*New Phytol.*, 41 (1942), No. 2, pp. 101-107, figs. 4).—In young stems split longitudinally the halves of the cambial ring are known to become rounded off into two rings by regeneration of the inner sides, and root tips behave similarly. Evidence is offered, mainly from experiments on sunflower hypocotyls, that the causal factor of this regeneration is neither a wound substance nor the formation of a new surface, but that in split stems it is the interruption of the continuity of the old cambial ring in the transverse directions. It is argued that if the splits cause regeneration by interrupting transverse continuity, then they must interrupt some process which normally occurs in these directions and maintains the unity of the organ. The evidence offered appears to indicate that this transverse process is not the movement of a hormone capable of diffusing out of the cells, and that it needs continuity of protoplasm.

Physiological studies in plant nutrition.—XII, Carbohydrate changes in the several organs of the barley plant during growth, with especial reference to the development and ripening of the ear, H. K. ARCHBOLD and B. N. MUKERJEE (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 21, pp. 1-41, figs. 9).—It is shown that there is no material interchange of carbohydrate between roots and aerial parts during ear development, so that the roots do not constitute a reserve for the ear. The amount of soluble glycosides, found highest in the leaves, fell towards harvest, but the loss was quite insignificant in relation to ear growth, so that this possible source of supply to the ear is also excluded. During the period of falling steam sugar (40 percent of the growth cycle) 60 percent of the ear growth was made, but the loss of sugar accounted for only about 10 percent of the final dry weight of the ear. Since there was also a further 10 percent loss from the fraction insoluble in alcohol and cold water, there was no major break-down of cellulose complexes to supply the ear, and it is suggested that this loss of insoluble material was in fact not of carbohydrate but of N compounds. At least 80 percent of the ear dry weight must therefore result from direct assimilation by the leaves, stems, and ears themselves, and stored sugar cannot be regarded as essential to ear development. The sugar in the immature ear amounted to only 5 percent of its final weight, and it is doubtful if even this amount was actually condensed to starch. It is suggested that the demands of the ear exercise no special control over loss of stored sugar.

The rates of sugar loss observed were probably not higher than might be expected if the sugar were lost in respiration, but the rapid loss from the leaf sheaths relative to leaves and from N-deficient plants relative to full-N plants makes it difficult to accept this as a complete explanation of all the loss. It is suggested that each internode acts as a separate unit receiving supplies from the attendant leaf and sheath, and there may be some movement of stabilized sugar from sheath to corresponding internode but it is deemed doubtful if there is a transference between the internodes themselves. There was no evidence of conversion of fructose to glucose or vice versa. Although the precise fate of the stored sugar remains uncertain, it was demonstrated that it plays no important part in ear development, and it is not yet certain that there is any upward translocation of such sugar at all. There are 22 references.

The culture of albino maize, H. A. SPOERRE (*Plant Physiol.*, 17 (1942), No. 3, pp. 397-410, figs. 2).—Albino corn plants were kept alive for several months by artificial nutrition with sucrose and showed a definite increase in dry weight above that of the seed from which they sprang. They also produced the same

number of leaves as normal plants and staminate and pistillate inflorescences. The albino leaves formed starch when infiltrated with sucrose and dextrose solutions but, in contrast to green leaves, not with solutions of glycerine or sorbitol. Some theoretical aspects of the use of cultures of albinos for elucidating certain phases of the photosynthesis problem are discussed. There are 18 references.

Effect of saline substrate on hourly levels of carbohydrates and inorganic constituents of barley plants, H. G. GAUCH and F. M. EATON. (U. S. D. A. and Tex. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 3, pp. 347-365, figs. 6).—To determine the relation between cyclic variations in transpiration rates on the accumulation of inorganic constituents and the effect of saline substrates on the accumulation of carbohydrates, barley plants were grown in sand cultures with base nutrient (control), and with this plus 100 millequivalents per liter of chloride and 200 m. e./l. of sulfate, respectively, sampled six times over a 24-hr. cycle. The relative weights of the three lots on a fresh weight basis were 100, 43, and 28, and on a dry weight basis 100, 61, and 43, respectively. The average moisture content of the three sets of plants was 90.6, 86.8, and 85.7 percent, respectively. Under all treatments essentially uniform concentrations of Ca, Mg, Na, K, P, N, sulfate, and chloride in the dry matter occurred over the 24-hr. cycle in which temperature rose to 98° F. and the relative humidity dropped to 13 percent at noon.

Addition of both chloride and sulfate salts reduced the Ca concentrations relative to controls, left Mg unchanged, caused a marked increase in Na and a marked decrease in K, and had little effect on total N and P concentrations. Accumulation of chloride in the controls was notably high, and addition of chloride brought about a further uptake. The controls contained 17 and the 200-sulfate plants 27.7 m.e. of S per 100 gm. of dry matter. Associated with this accumulation of S in the sulfate plants there was a depression in chloride content, but there was no change in the S content of chloride plants associated with chloride accumulation. Analyses for starch and sugars (4 p. m.) in the three sets of plants indicated that the accumulation of carbohydrates was associated with salt accumulation, showing that the salts interfered with the utilization of carbohydrates in cellular elaboration rather than with photosynthetic activity. There are 19 references.

Induced formation of a β -glucoside in the radish, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 5, pp. 359-360).—"Through its isolation as the tetraacetate, β -2-trichloroethyl-D-glucoside was shown to be formed in both roots and leaves of the radish from absorbed chloral hydrate."

The chlorophyll-protein compound of the green leaf, E. L. SMITH (*Chron. Bot.*, 7 (1942), No. 4, pp. 148-149).—A review and brief general discussion, with bibliography.

Nitrogenous character of penicillin, E. P. ABRAHAM, W. BAKER, E. CHAIN, H. W. FLOREY, E. R. HOLIDAY, and R. ROBINSON (*Nature [London]*, 149 (1942), No. 3778, p. 356).—Penicillin was shown to contain N.

Sulphur content of seeds and seed weight in relation to effects of sulphur deficiency on growth of sunflower plants, S. V. EATON (*Plant Physiol.*, 17 (1942), No. 3, pp. 422-434, figs. 5).—Seeds from sunflower plants grown in a minus-S nutrient solution were fewer per head and much smaller than the plus-S seeds, but they contained the same percentage of S as the latter though much less on the absolute basis. The plus-S seeds were smaller than the originals, and contained slightly less actual S per seed than the latter though more on a percentage basis. The small minus-S seeds germinated practically as well as the large plus-S and slightly better than the original seeds. Deficiency of S reduced

the size of plants from minus-S seeds more than that of plants from plus-S seeds, though this difference was small. As a means of reducing the error from S impurity in the seeds, the method proved unsatisfactory because of the relatively small plants produced by the small minus-S seeds. The effect of seed weight on the size of the plant was clearly shown, plants developing from the small minus-S seeds being much smaller than those from the larger plus-S seeds. However, considering the three lots of seeds the plus-S intermediate in weight between the minus S and the originals produced the largest plants. Relative to size of seeds, plants from minus-S seeds were larger than those from plus-S seeds, and this advantage was greater in plants grown with than without S in the nutrient solution. As shown by top-root ratios, size of seed affected the root more than the top, but the S-deficiency effect was the reverse. Production of larger plants by heavier seeds was due mainly to the greater amount of storage substances in the seeds. The only compound determined in this study was S, and the greater amount in the larger plus-S seeds was clearly one reason for the larger plants produced by these as compared with the minus-S seeds. It is unknown why the original seeds, which were larger and contained slightly more S than the plus-S seeds, failed to produce as large plants as the latter. It is suggested that competition among plants may account in part for the results obtained in this study.

Absorption of selenium by corn from *Astragalus* extracts and solutions containing proteins. S. F. TRELEASE, S. S. GREENFIELD, and A. A. DISOMMA (*Science*, 96 (1942), No. 2488, pp. 234-235, figs. 2).—Corn plants in culture solution absorbed far more Se from a water extract of *Astragalus* than from Na₂SeO₄. Furthermore, added bactotryptone, neopeptone, sodium caseinate, and proteose peptone approximately doubled the Se accumulation by corn, and smaller increases were obtained with other organic substances tested. It would seem obvious that various cultivated crops, themselves unable to rival the true indicator plants, might still be capable of significant activity as Se accumulators and converters in a soil rich in organic materials.

Absorption and accumulation of rubidium bromide by barley plants: Localization in the root of cation accumulation and of transfer to the shoot. F. C. STEWARD, P. PREVOT, and J. A. HARRISON (*Plant Physiol.*, 17 (1942), No. 3, pp. 411-421, figs. 2).—In barley roots there is a longitudinal gradation in cation accumulation similar to that shown for an anion (E. S. R., 76, p. 457), and such gradation was demonstrated for Rb and K by use of spectrographic methods. Like excised roots, those attached to the plant and in contact with a salt solution showed a gradation in salt concentration along their length—the highest being at the apex. Barley plants grown without access to external salts accumulated in their roots a greater concentration of Rb than of bromide from aerated RbBr solutions. The leafy shoot is the principal region of Rb accumulation, and the average concentration attained may exceed that even in the root tip. Br moves to the shoot more readily than Rb. After contact with RbBr solutions, and when transferred to solutions free of this salt, the shoot depleted the root of the salts it had previously absorbed—especially the bromide.

When the shoot removes Rb and bromide from the root it does so first from the younger segments. Eventually, however, ions (especially bromide) may be withdrawn even from levels at which the endodermis should be impermeable. During this process the normal gradient of salt accumulation may be reversed. It is in the region of the root in which growth and vascular differentiation occur that transfer from the storage cells of the root to the stele for movement to the shoot is localized. Accumulation of Rb did not progress for long in excised roots, which lacked the stimulus of the shoot, but in attached roots, despite some removal to

the shoot, the concentrations continued to increase for at least 130 hr. The shoot, which provides the stimulus for salt removal from the root also, by promoting the continued growth of the root, maintains at its apex the development and activity of the tissue chiefly responsible for absorbing salt from the external solution and transferring it to the stele and thence to the shoot. The uptake and distribution of salt is therefore responsive to the factors which in the whole organism correlate and integrate the growth of its parts. There are 12 references.

Substituted phenoxy and benzoic acid growth substances and the relation of structure to physiological activity, P. W. ZIMMERMAN and A. E. HITCHCOCK (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 5, pp. 321-343, figs. 6).—Several new growth substances are described and their effects on plants compared and contrasted with those reported for other hormonelike compounds. Among them, 2,4-dichlorophenoxyacetic acid and its derivatives proved most active for growth, inducing cell elongation of tomato at concentrations as low as 0.0007 percent in lanolin and comparing favorably with naphthaleneacetic acid. *p*-Chlorophenoxyacetic acid and *o*-chlorophenoxyacetic acid were less active, in the order named. When a Br group was substituted in the para position in the ring, the resulting compound was less active than when Cl occupied the same position. 2-Bromo-3-nitrobenzoic acid showed growth activity down to 0.05 percent in lanolin, and this is the first active compound with the carboxyl group linked directly to the ring. All the chlorophenoxy compounds exhibiting growth activity also induced another response having to do with morphogenesis. 2-Bromo-3-nitrobenzoic acid and 2-chloro-5-nitrobenzoic acid induced formative effects, though the latter was inactive for cell elongation. The new compounds varied in their capacity to induce adventitious root development, the *p*-chloro and 2,4-dichlorophenoxyacetic acids and amides being the most active. The chlorophenoxy compounds induced parthenocarp when applied to flowers of tomato and cucumber. Considering the activity of halogen substituted derivatives, it is believed likely that additional research in this new field will yield many more active compounds. There are 14 references.

The inhibition of germination, M. EVENARI, E. KONIS, and S. B. ULLMAN (*Chron. Bot.*, 7 (1942), No. 4, pp. 149-150).—This is a brief account of the authors' work on germination inhibition exerted by seeds and fruits on seeds of their own or of other species.

Seaweeds at Beaufort, North Carolina, as a source of agar, H. J. HUMM (*Science*, 96 (1942), No. 2488, pp. 230-231).—In initiating a systematic testing of all the more common larger species of red algae of the Atlantic Coast from Beaufort southward to the Florida Keys, preliminary tests indicated that in the most common species (*Gracilaria confervoides*) 25-35 percent of its air-dry weight is agar. The alga is present in large amounts, is easily collected, and the method of preparation is described. Another common species is *Hypnea musciformis*, from which agar can also be made but which thus far, though usable, has been inferior in quality. Determinations on two species of pelagic *Sargassum* showed their content in alginic acid to be very small. Similar determinations of other red and brown algae are planned.

Formation of nicotine in plants grafted on tobacco, A. SEMUCK, A. SMIRNOV, and G. IL'YIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 32 (1941), No. 5, pp. 365-368).—When scions of *Solanum nigrum*, tomato, and *Datura stramonium*, none of which normally synthesize nicotine, were grafted onto tobacco stocks, all three species were found to elaborate nicotine. Conversely, when tobacco scions were grafted onto stocks of these three species, the tobacco itself lost its power to synthesize the alkaloid. It thus seems obvious that formation of nicotine by tobacco is connected in some obscure way with

the root system and stem of the plant. Tobacco grafted onto *Nicotiana glauca* also lost its ability to elaborate nicotine, forming anabasine instead, but when *N. glauca* was grown on a tomato stock it produced as much anabasine as control plants on their own roots. The significance of these findings are briefly discussed.

Interaction between *Lycopersicum esculentum* and *Datura stramonium* in the case of grafting, J. J. KERKIS and N. N. FIGULEVSKAYA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 32 (1941), No. 7, pp. 505-508, figs. 3*).—In the grafting experiments reported, atropine was found in all parts of the tomato scion on *D. stramonium* stock and no correlation was noted between the amount and the relative ages of the graft components involved. However, the concentrations in different parts of the graft differed greatly, the lowest quantities occurring in the fruit. With tomato as stock under *Datura*, its fruit contained only insignificant amounts of atropine, but the amounts in the green parts of the tomato differed but little whether it was used as stock or scion. Atropine was always present in *Datura* grown on tomato stock, but none was contained in the progeny of seed from plants receiving their atropine by way of grafting. Though the biochemical properties of all parts of the tomato plant underwent considerable changes from grafting on *Datura*, the form of its fruit was very little affected.

Ergot, J. C. NEILL (*New Zeal. Jour. Sci. and Technol., 23 (1941), No. 3A, pp. 130A-137A, figs. 8*).—The occurrence in New Zealand and life history of ergot (*Claviceps purpurea* and *C. paspali*) are briefly described, and an account is given of preliminary commercial production trials on rye.

The chemistry, pharmacology, and toxicology of ergot (*Claviceps purpurea*), I. J. CUNNINGHAM (*New Zeal. Jour. Sci. and Technol., 23 (1941), No. 3A, pp. 138A-145A*).—Some new toxicological data are included in this study.

Manual of methods: Supplement to Leaflet I (*Pure Cult. Study Bact., 10 (1942), No. 3, pp. [2]+8*).—A review is presented of certain basic considerations underlying the purposes for which the publications of the Committee on Bacteriological Technic of the Society of American Bacteriologists are issued. These include the meaning of pure culture study, relation to taxonomy, publications of the committee, pitfalls to be avoided by the student, and practical hints.

Routine tests for the descriptive chart: Morphological and biochemical, H. J. CONN ET AL. (*Pure Cult. Study Bact., 10 (1942), No. 2, Leaflet 5, 8. ed., pp. [2]+23, fig. 1*).

Growth factors for bacteria.—XIII, Purification and properties of an eluate factor required by certain lactic acid bacteria, B. L. HUTCHINGS, N. BOHONOS, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 141 (1941), No. 2, pp. 521-528*).—"A method for the preparation of concentrates of the norit eluate factor is presented. The active principle is an acid and probably contains an amino group. The nutritional importance of the compound is indicated by its indispensable role in the nutrition of certain bacteria and its probable requirement by the chick."

On the width and origin of bacterial flagella, G. KNAYS. (Cornell Univ.). (*Science, 95 (1942), No. 2468, pp. 406-407*).—Using methods described and a photograph of *Aerobacter cloacae* taken with the electron microscope, the width of the flagellum was found to be between 0.02μ and 0.03μ in thickness, with an average ratio of 1:22 between the width of the dried flagellum and that of the dried cytoplasm. Furthermore, the flagellum apparently arises from the cytoplasm rather than the cell wall.

Bacteria attacking petroleum and oil fractions, R. W. STONE, M. R. FENSKE, and A. G. C. WHITE. (Pa. State Col.). (*Jour. Bact., 44 (1942), No. 2, pp. 169-178*).—Cultures capable of attacking crude oil, lubricating oils, vaseline, asphalt, and all other petroleum fractions used were obtained from garden soil

and their reactions studied in detail. All were motile gram-negative rods, including *Pseudomonas* and many white-mucoid types. They were obtained from all soil samples tested and appeared to be of common occurrence. The cultures exhibited no specific ability to attack one type of oil but rather a capacity to adapt themselves, according to conditions, to attack any particular oil present. There are 15 references.

A bacteriological comparison between synthetic and natural glycerol, H. J. PEPPLE. (Kans. Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 2, pp. 233-236).—Studies of growth on glycerol-salts media and of dehydrogenase activity of suspensions of micro-organisms (*Mycotorula* and bacteria of widely different genera) indicated synthetic glycerol (Shell) to be as good a substrate as glycerol derived from lipids. Culture of *Phytomonas tumefaciens* and *Salmonella pullorum* in the synthetic media had no deleterious effect on their virulence.

Nitrogen fixation in leguminous plants.—I, General characters of root-nodule bacteria isolated from species of *Medicago* and *Trifolium* in Australia, H. L. JENSEN (*Linn. Soc. N. S. Wales, Proc.*, 67 (1942), pt. 1-2, pp. 98-108, pl. 1, figs. 3).—From host plants grown in Australia, 24 strains each of *Rhizobium meliloti* and *R. trifolii* were isolated, and as a whole they conformed to the general descriptions of the two species. Carbohydrate fermentation revealed no subgroups within the species, but was stronger in *R. meliloti*. The limits for growth were pH 5.1-5.3 for *R. trifolii* and pH 5.3-5.5 for *R. meliloti*. In well-buffered nutrient solutions, particularly in the presence of organic salts, *R. trifolii* failed to grow at pH 7.1-7.5 and had an optimum at pH 5.5-6.5, whereas *R. meliloti* had an optimum at pH 7-8 and grew at values above pH 8.7. All *R. trifolii* strains (except one) produced nodules on sterile seedlings and appeared to be effective on some species of clover; the inefficiency of strains from white clover on subterranean clover and vice versa was an inconstant phenomenon. All strains of *R. meliloti* produced effective nodules on alfalfa, but in burr trefoil this was true only for strains isolated from varieties of *M. hispida*. These strains belonged to a group apparently differing from the rest in being slightly more sensitive to acid reaction and in not readily forming a clear zone in milk. Some *R. meliloti* strains dissociated, giving rise to two types of variants, one producing a mucoid and the other a firm and wrinkled growth. There are 20 references.

The effectiveness of certain strains of the soya-bean nodule organism when associated with different varieties of the host plant, J. BOYES and G. BOND (*Ann. Appl. Biol.*, 29 (1942), No. 2, pp. 103-108).—The results of observations on N fixation by four strains of soybean nodule bacteria, when associated with four host varieties (Manchu, Brown C, Black O, and Green Jap) grown in sand culture in the greenhouse, agreed with those of certain previous investigators in showing that the relative effectiveness of some of the strains varied when associated with different host varieties. The reason for this variation is briefly discussed, and consideration is given to the best basis for comparing the effectiveness of bacterial strains associated with host varieties of different growth habit or with the same host variety under different conditions. Those strains effective with the American variety Manchu were also effective with the British varieties. There are 13 references.

The mycorrhizal relations of larch.—III, Mycorrhiza formation in nature, J. E. HOW (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 21, pp. 103-129, pl. 1, figs. 6).—In continuation (E. S. R., 85, p. 601), the roots of *Larix decidua* were found capable of being grouped into two classes, lateral and sublateral, corresponding to the long and short roots of pine. The majority of the mycorrhizas were normally formed by infection of the sublaterals. *Boletus elegans* and

Paxillus involutus were isolated from larch mycorrhizas, and *Mycellum radialis atrovirens* from pseudomycorrhizas. Evidence is presented that infection of the sublaterals by a mycorrhiza-former such as *B. elegans* results in an increase in the number of cortical cells in the roots as compared with the uninfected or with infection by pseudomycorrhizas. Detailed descriptions are given for the structural features resulting from infection by *B. elegans*, *B. viscidus*, *P. involutus*, a yellow hymenomycete mycellum, *M. radialis atrovirens*, and two unidentified mycellia. The general features of mycorrhiza formation in larch are discussed, and an appendix takes up mycorrhiza formation in experimental culture. There are 30 references.

Respiratory studies of the micrococci, T. D. NUNHEIMER and F. W. FABIAN. (Mich. Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 2, pp. 215-232, figs. 2).—The results of a study of the respiratory activities of *Micrococcus luteus*, *M. flavus*, *M. aurantiacus*, *M. cinereus*, and *M. freudenreichii* are presented in detail.

Bactericidal effects of *Aspergillus clavatus*, B. P. WIESNER (*Nature [London]*, 149 (1942), No. 3778, pp. 356-357).—Two strains of *A. clavatus* proved capable of sterilizing fluid media inoculated with *Staphylococcus aureus* and other organisms. The active substance differed from penicillin not only by being bactericidal as well as bacteriostatic but also in several other characters.

A simple photoelectric relay, E. B. WORKING. (Kans. State Col.). (*Science*, 96 (1942), No. 2490, p. 281, fig. 1).—The relay described was used in the station milling research laboratory for controlling an adiabatic calorimeter for measurement of the heating of damp wheat.

An atmospheric halatometer, C. P. SIDERIS. (Univ. Hawaii). (*Plant Physiol.*, 17 (1942), No. 3, pp. 497-499, fig. 1).—Measurement of salt water carried by strong winds from the ocean and deposited on crop plants grown in fields near the coast becomes at times an important economic problem. For use in this and similar studies, an apparatus for collecting salt particles from the atmosphere was developed and is described and illustrated.

GENETICS

Mock-dominance and hybrid vigor, F. D. RICHEY (*Science*, 96 (1942), No. 2490, pp. 280-281).—Two plant varieties, one with twice as many internodes of half the length as the other, will be equal in height. A hybrid between them will exceed their height by 12.5 percent if internode number and length are exactly intermediate in inheritance, i. e., without dominance. This effect, here termed "mock-dominance," "results from the fact that plant height is determined as the product of number and length of internodes and from the relations that obtain between the means of products and the product of means." The same principle applies to other characters such, e. g., as yields of grain, leaf areas, growth rates, and chlorophyll content v. leaf area. The applications to plant breeding are briefly discussed.

Western Guatemala a secondary center of origin of cultivated maize varieties, P. C. MANGELSDORF and J. W. CAMERON (*Harvard Univ., Bot. Mus. Leaflet*, 10 (1942), No. 8, pp. 217-252, pls. 2, fig. 1).—In a previous publication by Mangelsdorf and Reeves (*E. S. R.*, 82, p. 177), the tripartite theory of the origin of corn was presented. This study concerns itself with the concept that new types of corn originating directly or indirectly from the *Zea-Tripsacum* cross and admixture with *Tripsacum* comprise the majority of Central and North American varieties. Chromosome knob counts in 162 varieties from 38 western Guatemala localities showed a range in numbers from 1 to 16, and all of the 18 knob positions known in corn and also 3 previously unreported positions were

encountered. The greatest diversity was found in a small area where low-knob and high-knob varieties occur in close proximity, and this is also the area in which teosinte is found growing in the wild. The corn of western Guatemala exhibits great external morphological diversity, but plants with 6 knobs or less uniformly possess pubescent leaf sheaths, a coarse seminal root system, and susceptibility to lodging and smut. These varieties were found only at altitudes of 6,500 ft. or more. The number of chromosome knobs was associated with various characteristics which may have been derived from *Tripsacum*. The combined evidence suggests that a South American corn variety—characterized by pubescent leaf sheaths, coarse seminal roots, and susceptibility to lodging and smut—hybridized with a species of *Tripsacum* to produce the new genus *Euchlaena* and new corn varieties exhibiting *Tripsacum* admixture. Western Guatemala is thus regarded as a secondary center of origin of cultivated corn varieties. The potential value for purposes of plant breeding of the tripsacoid corn varieties of Guatemala is pointed out. There are 22 references.

The association of mutants with homozygous deficiencies in *Zea mays*, B. MCCLINTOCK. (Univ. Mo.). (*Genetics*, 26 (1941), No. 5, pp. 542-571, pls. 2, figs. 2).—Corn mutants were found to arise following changes in the chromatin constitution of the ring-shaped chromosomes, such changes being produced after their aberrant behavior in some of the mitotic divisions. The types of mutants produced by these altered chromosomes were simple (composed of a single recognizable character) or compound (composed of two or more of the characters recognizable as simple mutants). In a number of cases the altered ring-shaped chromosomes producing the simple or compound mutants were isolated. By appropriate tests it was proved that the compound mutants were the products of two or more of the simple mutants. One group of mutants was located within the limits of the proximal four chromomeres of the short arm of chromosome 5, and the second group within the limits of the next five chromomeres. Evidence led to the conclusion that each mutant character was produced by a homozygous minute deficiency and associated with loss of a particular minute segment. The simple mutants were associated with loss of one such segment, and the compound with loss of two or more.

Incomplete seed failure as a result of somatoplastic sterility, R. A. BRINK and D. C. COOPER. (Univ. Wis.). (*Genetics*, 26 (1941), No. 5, pp. 487-505, figs. 7).—In the cross *Nicotiana rustica* ♀ × *N. tabacum* ♂, most of the hybrid seeds collapse before capsule maturity, but in *N. rustica* selfed seed formation is normal and in *N. rustica* ♀ × *N. glutinosa* ♂ all the seeds abort at an early stage. The course of development of the *N. rustica* × *N. tabacum* seeds was similar to that in the *N. rustica* × *N. glutinosa* in the retardation of endosperm growth, pronounced hyperplasia of the nucellus, and failure of the integumentary cells between the vascular bundle apex and the chalazal pocket to differentiate into conducting elements, but development of the former hybrid was less abnormal than that of the latter. The two kinds of hybrid seeds differed from each other and from normal *N. rustica* seeds even at the 2-cell proembryo stage in relative volumes of endosperm and nucellus. The proportions of seeds of the different hybrids in which the endosperm was occluded by overgrowth of the nucellus at the 8- to 16-cell embryo stages are compared. In all *N. rustica* × *N. tabacum* seeds continuing growth beyond the early stages the endosperm was in direct association with the integument through a narrow gap in the nucellus at the chalazal end, and the endosperm and embryo in persisting seeds grew at the expense of the integument. This hybrid is interpreted as a case of incomplete somatoplastic sterility, the developmental changes associated with this phenomenon usually proceeding to a point resulting

in seed failure. These findings are discussed in relation to seed failures in other plants, particularly cultivated fruits. There are 23 references.

Genetic nature of self- and cross-incompatibility in potatoes, B. P. PAL and P. NATH (*Nature* [London], 149 (1942), No. 3774, pp. 246-247, fig. 1).—The results of the four crosses outlined are said to show that self- and cross-incompatibility in *Solanum caldasi* and *S. subtilis* are distinctly inherited characters. Detailed examination of the available data indicated five sterility factors which, operating in various combinations, determine self- and cross-incompatibility. The genetic composition of the eight major groups of plants was established and is diagrammatically shown. It is pointed out that the two species not only resemble each other closely in floral and vegetative characters and in reactions to short-day conditions, but also possess sterility factors in the same allelic series. Thus there appears no valid reason for regarding them as separate species.

An amphidiploid *Lactuca*, R. C. THOMPSON. (U. S. D. A.). (*Jour. Hered.*, 33 (1942), No. 7, pp. 253-264, figs. 5).—Partially fertile F_2 progenies were obtained in certain crosses of 9- and 17-chromosome *Lactuca* species. Detailed cytological examinations of the F_1 root tips and of microsporogenesis in the F_2 plants revealed that these are amphidiploids with 26 pairs of somatic chromosomes. In an F_2 population of 127 plants there was no evidence of segregation, the plants appearing identical as in a fixed species. The possible origin of the amphidiploids is discussed in detail. Evidently reduction division in the F_1 generation must have failed in the genesis of the female gametophyte, and all of the plants in the F_2 generation must have developed from the union of the unreduced gametes.

Induction of polyploidy in crop plants, L. S. S. KUMAR and A. ABRAHAM (*Cur. Sci. [India]*, 11 (1942), No. 3, pp. 112-113, figs. 4).—This note deals with the colchicine technic and detailed results of induced polyploidy in black gram (*Phaseolus radiatus*=*P. mungo*), and with the consequences of autopolyploidy.

Tetraploidy in tomatoes induced by the use of colchicine, E. C. STAIR and R. K. SHOWALTER. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 383-386, figs. 2). Tetraploid tomato plants were produced by immersing the tips of young vigorous plants in vials of colchicine solution and by soaking seeds in the same material. The tetraploid plants produced seed which resulted in large nonfruitful tetraploids. The production of tetraploids would appear to have no commercial value insofar as increased size of fruit or yields is concerned, but conceivably might be of value in facilitating the crossing of some rather distantly related species needed in breeding programs.

Apple breeding: Variation within and between progenies of Delicious with respect to freezing injury due to the November freeze of 1940, H. L. LANTZ and B. S. PICKETT. (Iowa Expt. Sta. Coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 237-240).—Slightly over one-half of 1,603 trees, representing 24 different crosses in which Delicious occurred as one parent, were rated as having none or slight injury following the disastrous November 1940 blizzard. The individual progenies varied widely in their behavior, but in nearly if not all of the lots some trees were found which were free from freezing injury. The hardiness of the second parent was the potent factor with Wealthy, Patten, and Antonovka crosses, all of which contained a high percentage of hardy seedlings. The Jonathan×Delicious combination, despite the fact that both parents suffered great damage in the freeze, contained some seedlings with a high degree of cold resistance. In general, it was evident that hardy parents transmitted hardiness to a relatively high percentage of their seedlings.

An analysis of the fruit characteristics of seedlings of Rome Beauty, Gallia Beauty, and Golden Delicious parentage, F. O. HARTMAN and F. S.

HOWLETT. (Ohio State Univ. and Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942) pp. 241-244).—In discussing the results of apple breeding studies, the authors suggest that the varieties Rome Beauty and Gallia Beauty have only very limited use in breeding work where good color and dessert quality are desired. These varieties transmitted predominantly the factors for late blooming, only fair color, poor quality, January season, medium size, and mid-October picking maturity. Apparently both varieties have a heterozygotic genetic constitution, and a number of factors or genes, both cumulative and differential, govern the inheritance of the characters considered in the experiment.

Cytogenetic studies in *Poa pratensis* and its hybrid with *Poa alpina*, E. ÅKERBERG (*Hereditas*, 28 (1942) No. 1-2, pp. 1-126, figs. 61).—This monographic study (with 88 references) includes investigations of 12 specially selected strains of *P. pratensis*, progeny investigations of material collected in nature, and the results of crosses with *P. alpina*.

Genetic control of biochemical reactions in *Neurospora*: An "amino-benzoicless" mutant, E. L. TATUM and G. W. BEADLE. (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 6, pp. 234-243, figs. 4).—An X-ray-induced mutant strain of *N. crassa* was obtained which requires *p*-aminobenzoic acid, its growth being a function of the amount supplied. With adequate amounts available it was indistinguishable from the parent strain, from which it was found to differ by a single gene. Sulfanilamide inhibited the growth of both parent and mutant strains, and in both cases the inhibition was overcome by excess *p*-aminobenzoic acid. A number of substances related to *p*-aminobenzoic acid were able to replace it, but their activities were much less pronounced. It is concluded that none of them is concerned with its normal synthesis, and that this biosynthesis probably does not involve the introduction of an amino group into a preformed benzene ring. There are 13 references.

Tetraploidy in *Antirrhinum majus* induced by sanguinarine hydrochloride, T. M. LITTLE. (U. S. D. A.). (*Science*, 96 (1942) No. 2486, pp. 188-189).—In this preliminary report, tetraploidy is said to have been induced by this alkaloid in at least 5 percent of the treated snapdragon plants, and the effect on mitosis in excised *Lilium* roots was also similar to that of colchicine in producing shortened and split "C-chromosomes."

A centrifugação fonte de variações cromosômicas [Centrifugation as a cause of chromosome variations], A. CÂMARA (*Agron. Lusitana*, 2 (1940), No. 2, pp. 181-202, pls. 3, figs. 14; *Eng. abs.*, p. 200).—Centrifuging the pollen mother cells of *Rhoeo discolor* proved effective in producing chromosome variations, the quantitative variations most frequently observed being those resulting from nondisjunctions. Structural changes consisted chiefly of chromosome fusions, resulting in the formation of bridges and fragments. The method is believed to show promise for inducing the polysomic condition in plant breeding. There are 25 references.

Raças cariológicas na *V. sativa* L. [Karyological races of *Vicia sativa*], L. A. COUTINHO (*Agron. Lusitana*, 2 (1940), No. 4, pp. 379-403, figs. 8; *Eng. abs.*, pp. 402-403).—This study was undertaken as a contribution to the systematics of lines of *V. sativa* subspecies *angustifolia* and *obovata*, *V. amphicarpa*, and *V. macrocarpa*, and to provide data for breeding. The same chromosome constitution ($2n=12$) and the same morphological types were found for the *V. sativa* lines studied, and a partial analogy was also observed between them and *V. macrocarpa* with regard to chromosomes B, C, D, and E. Plants of a hybrid line showed some alterations in chromosome number and also some nonhomologous chromosomes associated with sterility for the great majority of individual plants. This sterility is discussed. It was possible to identify *V. sativa* and *V.*

macrocarpa as the parents of this hybrid through the presence of the more complete chromosome sets peculiar to those species. From these studies on *V. sativa* and *V. macrocarpa* and work of others on *V. sativa* and *V. amphicarpa*, it is concluded that the three species are distinct (mainly due to the presence of "unstable" chromosomes A, B, F, G, and H), though closely related as shown chiefly by the characteristic "stable" chromosomes C, D, and E.

Hereditary transmission of induced tetraploidy and compatibility in fertilization, A. B. STOUT and C. CHANDLER (*Science*, 96 (1942), No. 2489, pp. 257-258).—The present report confirms previous results (E. S. R., 85, p. 602), the condition of induced tetraploidy eliminating the self-incompatibility of the diploid somatic parent in *Petuna axillaris*. This condition was transmitted to all tetraploid recombinations of genetic factors obtained in each of the seed progenies. Also among the members of each progeny there was complete cross-compatibility for at least some one of the classes of pollen segregating from the tetraploid complex. In backcross relations the only incompatibility that continued was when the haploid pollen of a self-incompatible parent was used to pollinate a pistil of the tetraploid offspring. In the diploid plants of *P. axillaris* there is genetic control (E. S. R., 80, p. 29) in the relations of fertilization which effects self- and cross-incompatibilities, but when these genetic factors were duplicated in tetraploid branches and in their seed progenies there was no longer expression in respect to seed production of either self-incompatibility or intra-sib cross-incompatibility.

The influence of inbreeding on birth weight, rate of growth, and type of dairy cattle, J. W. BARTLETT, R. P. REECE, and O. L. LEPARD. (N. J. Expt. Stas.) (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 206-212).—Data are presented showing that inbreeding can be practiced successfully with dairy cattle provided one begins with genetically superior animals and employs rigid selection (E. S. R., 82, p. 239). In the conduct of this study 112 Holstein-Friesian heifers produced by 5 sires were classified for body type, with weights and measurements taken at birth and approximately 5-mo. intervals up to and after calving. Inbreeding directed toward the family of Ormsby Sensation 45th indicated that there were carried factors for heavier weight at birth, but no relation was found between intensity of inbreeding and type.

Cross-breeding for beef production, R. W. PHILLIPS, W. H. BLACK, B. KNAPP, JR., and R. T. CLARK. (U. S. D. A. coop. Mont. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 213-220).—Data are presented on the weights, feed consumption, and carcass grades of 57 crossbred Shorthorn ♂ × Hereford ♀ steers in comparison with 67 purebred Hereford steers. These data showed the crossbreds to excel in rate of gain, dressing percentage, and fewer digestive disorders than were experienced in purebreds. Differences in the efficiency of gain, slaughter grades, and carcass quality were not statistically significant. In general crossbred steers exhibited less variability than purebreds in the 2 yr. of the study.

Prenatal development of the bovine, L. M. WINTERS, W. W. GREEN, and R. E. COMSTOCK (*Minnesota Sta. Tech. Bul.* 151 (1942), pp. 50, figs. 65).—The prenatal development of the bovine, as ascertained from specimens of ova, embryos, and fetuses of known age in their dams, slaughtered at periodic intervals, is described. Measurements are presented as well as indications of the attachments and changes occurring at different stages of development.

Crossbreeding for lamb and wool production, J. A. GORMAN, F. S. HULTZ, R. L. HINER, O. G. HANKINS, and D. A. SPENCER. (Coop. U. S. D. A.). (*Wyoming Sta. Bul.* 254 (1942), pp. 48, figs. 12).—Study of the carcass quality and character of wool produced by lambs from Rambouillet grade ewes mated with

Columbia, Corriedale, Lincoln, and Romney rams over a 5-yr. period showed that in the character of the fleece the first-cross Corriedale lambs ranked highest, whereas the Lincoln rams produced the best length of 12-month fleeces, and the Columbia lambs excelled in pounds of grease wool produced in 12 months. The wool produced by the crossbred ewes at different ages did not significantly alter the order of superiority. In average wool weight at 1, 2, 3, or 4 yr. of age second-cross hybrids were not significantly better than the original grade Rambouillet ewes. The staple length was greater but much variation in fleece weight, fleece grade, and staple length existed within the groups sired by rams of the different breeds. In sheared body weight at 12 mo. of age the hybrids from the several sires ranked as Columbia, Lincoln, Romney, and Corriedale. Of the ewes that actually raised lambs those bred to Columbia rams produced an average of 82.52 lb., as contrasted with 77.27, 76.71, and 71.85 lb. by Romney, Corriedale, and Lincoln rams, respectively. The first-cross ewes, Corriedale \times Rambouillet, produced 121 second-cross lambs, of which 108 were raised per 100 ewes. A brief summary is presented, based on detailed studies and measurements of the carcasses, proportion of the cuts, color, cooking qualities, and palatability. These results showed that the lambs at slaughter generally rated medium, with the Lincoln \times Rambouillet being slightly inferior. The lambs sired by the Columbia rams produced carcasses which graded medium after both the first and second cross. Carcasses sired by the other rams received less favorable grades.

Influence of heredity and other factors on 180-day weight in Poland China swine, J. A. WHATLEY, JR. (Iowa Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 5, pp. 249-264, figs. 5).—Statistical analyses of variance of 180-day weights of 1,394 Poland China pigs produced in 267 litters in relation to the inbreeding in the continuance of the herd closed to outside blood (E. S. R., 78, p. 469) indicated that at least 30 percent and perhaps more than 40 percent of the individual variance was due to the additive effects of genes. Studies were made of variance within litters and between litters having the same and different sires and dams. The degree of heritability depending on the resemblance between related and unrelated animals was calculated as 20 percent from paternal half sibs, 40 percent from full sibs not litter mates, and 30 percent as a result of the action of genetic factors combining additively. Regression of variance on percentage inbreeding supplemented and confirmed these estimates. The regression coefficient indicated an average decrease of 0.76 lb. in weight for each 1 percent increase in inbreeding. Weaning weight was twice as important as birth weight as an indication of the 180-day weight. Seasonal differences and year-to-year changes in environment were influencing factors, as were differences in the age of dams, but the latter influence was small. Because of the selected nature of the parents it was considered that correlations of 0.051 and 0.132 between paternal and maternal half sibs, respectively, 0.152 between dam and offspring, 0.339 between litter mates and 0.202 between nonlitter mate sibs were underestimates of what should occur in an unselected population.

Close linkage between mutations with similar effects, L. C. DUNN and E. CASPARI (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 5, pp. 205-210).—In connection with further studies of the morphological effects of genes, which the authors have found to be located in similar areas of the chromosomes of mice, attention is called to five mutations which are designated as *Fu*, *Ki*, *t²*, *t³* and *t⁴*. These are shown to be grouped in two classes: One involves *Fu* and *Ki* and the other the *T* series discussed by Gluecksohn-Schoenheimer (E. S. R., 84, p. 313). There is indication in the single tailless animal produced in 785 progeny that *Ki* and *T* may produce a greater interaction when both are present on the same chromosome. The simplest assumption concerning the relationship of *T Kink* and *Fused* is

that they represent mutations in duplicate loci lying next to each other in the chromosomes. This of course is an assumption.

Growth in silver dwarf mice, with and without injections of anterior pituitary extracts, R. W. BATES, T. LAANES, E. C. MACDOWELL, and O. RIDDLE (*Endocrinology*, 31 (1942), No. 1, pp. 53-58, fig. 1).—Significant weight increases were shown to result in Silver dwarf mice (E. S. R., 86, p. 32) from treatment with 1 μ g. daily doses of two anterior pituitary fractions—one involving prolactin and the other practically free of prolactin. It was shown that a 30-percent gain in body weight was induced by the treatment.

Skeletal abnormalities of short spined turkeys, V. S. ASMUNDSON. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 1, pp. 120-123, figs. 2).—In a closely inbred strain of Bourbon Red turkeys there were noted 3 segregating families from which there were produced 59 normal to 14 progeny with shortened necks and bodies which failed to hatch. The lethal mutation was considered due to the action of an autosomal recessive. The heads were abnormal in those not hatching, and such birds showed the necks and bodies to be reduced in length due to a crowding of the vertebrae. Ash analysis showed the wing and leg bones to be approximately normal, but the ash in the scapula and ilium was reduced.

Pituitary weight in growing New Zealand white rabbits in relation to live weight, H. H. KIBLER, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 31 (1942), No. 1, pp. 59-62, fig. 1).—Based on 328 σ and 370 ϕ New Zealand white rabbits over 3 kg. in weight, it was shown that the sex relations to body weight were statistically significant. In both sexes the ratio of pituitary to body weight was found to decline during growth. Tables are presented for calculating pituitary weights for both sexes from variable body weights.

Ovulation and its relation to estrus in cows, A. NALBANDOV and L. E. CASIDA. (Univ. Wis.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 189-198).—In 72 heat periods of 22 grade dairy cows, ovulation usually occurred at approximately 11 o'clock in the morning with oestrous ending at 8-9 o'clock the evening before. From these data it appeared that mating or insemination during the afternoon of day of heat would probably be better than mating in the morning. Differences in the time of termination of oestrous and the occurrence of ovulation were noted between cows first found on heat in the afternoon and in the morning. A considerable part of the variance in time of ovulation was attributed to differences between individuals. The later the hour that heat ended the later the time of ovulation. These results with dairy cattle showed much similarity to those for beef cattle noted by Brewster and Cole (E. S. R., 85, p. 239).

Effects of crystalline estrin implants on the tibia of young hypophysectomized female rats, E. A. KIBRICK, M. E. SIMPSON, H. BECKS, and H. M. EVANS. (Univ. Calif.). (*Endocrinology*, 31 (1942), No. 1, pp. 93-96, figs. 4).—No histological differences were noted between the tibia of hypophysectomized rats treated by subcutaneous implantation of pellets of oestrin and their untreated controls. The typical picture of hyperossification of the subepiphyseal zone of the tibia was not produced in the absence of hypophysis. The study was conducted with 20 ϕ rats hypophysectomized at 54-58 days of age, with one-half being treated with the oestrin implants and one-half serving as controls. An additional 10 normal ϕ s were included.

Reports on biological standards.—V, Variables affecting the estimation of androgenic and oestrogenic activity, C. W. EMMENS ([*Gt. Brit.*] *Med. Res. Council, Spec. Rpt. Ser. No. 234* (1939), pp. 71, figs. 22).—In continuation of the series previously noted (E. S. R., 77, p. 297), the author found the influence

of various conditions and factors on the oestrogenic activity of extracts showed the need for uniformity of dosage and method and number of injections of ovariectomized mice. Conditions must also be uniform for the determination of the potency of androgens as to their influence on comb growth in capons and day-old chicks.

Observations on the transport of tubal ova, H. O. BURDICK, R. WHITNEY, and B. EMERSON (*Endocrinology*, 31 (1942), No. 1, pp. 100-108, figs. 9).—Ova were seen under proper lighting conditions in the fallopian tube of the albino mouse. Peristaltic movements seemed responsible for transportation of tubal ova, but cilia may play a part in this movement. After fertilization gentle contractions roll the ova about and the cumulus cells drop away in 24 hr. Transportation through the isthmus requires only about 24 hr.

Effects of lactogenic and gonadotropic hormones on hypophysectomized pregnant rats, E. CUTULY (*Endocrinology*, 31 (1942), No. 1, pp. 13-22, pls. 2).—The interruption of pregnancy in 40 rats hypophysectomized from 1 to 9 days after mating was prevented by the administration of hypophyseal gonadotropin and lactogen but not by pregnant mare serum. These results suggested that gonadotropic substances may cause the formation of corpora lutea and stimulate them to secrete progesterone.

Detailed description of technique for androgen assay by the chick comb method, R. T. FRANK, E. KLEMPNER, F. HOLLANDER, and B. KRISS (*Endocrinology*, 31 (1942), No. 1, pp. 63-70, fig. 1).—Details of the technic employed in this method are described.

The effect of the method of making semen smears upon the number of morphologically abnormal spermatozoa, G. W. SALISBURY, E. L. WILLETT, and J. SELIGMAN. (Cornell Univ.). (*Jour. Anm. Sci.*, 1 (1942), No. 3, pp. 199-205).—The most satisfactory method for the preparation of semen smears consisted of drawing a drop of diluted semen between two microscopic slides, drying and clearing in chlorazene, and staining in carbol fuchsin and gentian violet. In the conduct of the study comparison was made by variance of samples collected from successive ejaculates of four bulls with variable reproductive records and single samples from three bulls. There were significant differences between individuals with respect to the effect of preparation of the smear and the occurrence of abnormal types. The study emphasized the need for a standard procedure for examining the samples and the examination of more than one sample from each animal.

Artificial insemination of farm animals, W. W. GREEN, L. M. WINTERS, and R. E. COMSTOCK (*Minnesota Sta. Bul.* 336, rev. (1942), pp. 24+[7], figs. 14).—A revision of the bulletin previously noted (*E. S. R.*, 80, p. 330) bringing up to date the more advanced methods of artificial insemination of livestock and poultry, with recommendations for the management of sires and dams.

FIELD CROPS

[Agronomic research in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 43 (1942), pp. 30-31, 35-37, 41, 42-45, 68-87, 88-89, 181, 182-183, 209-210, 211, 219, 220-221).—Papers of interest to agronomists, presented at the convention of the Association of Southern Agricultural Workers at Memphis, Tenn., February 4-6, 1942, reported largely in abstract form, included Some Indicated Benefits of Rotating Cotton With Close Growing Crops, by J. R. Carreker (p. 30), The Effect of Grazing in Maintaining Open Drainage Ditches, by H. Matson (p. 31), The Use of Kudzu in a Rotation System, by E. C. Richardson (p. 41), *Lespedeza, sericea* in Crop Rotations, by L. D. Eagles (pp. 42-43),

Influence of Organic Mulches and Incorporated Organic Matter on Runoff, Erosion, Soil Structure, and Microbial Activity (pp. 72-73) and Influence of Mulches Versus Incorporated Organic Matter on Soil and Moisture Conservation (p. 219), both by T. C. Peele, The Use of X-Ray in Estimating Strength Differences in Cotton Varieties, by H. W. Barre and E. E. Berkley (pp. 83-84), and Machinery Developments in Relation to Stubble Mulch Culture, by R. M. Merrill (pp. 220-221) (all U. S. D. A.); The Effect of Different Phosphatic Fertilizers on the Chemical Composition of Pasture Herbage, by R. E. O'Brien (pp. 35-36), and The Effect of Organic Matter on the Physical Properties of Berks Silt Loam, by S. S. Obenshain and P. T. Gish (p. 72) (both Va. Expt. Sta.); Breeding Sorghums for Low Cyanide Content, by P. G. Hogg (pp. 36-37), The Present Status of the Program for Determining the Complete Usage of the Sweet Potato Plant for Silage and Other Types of Feed, by H. W. Bennett (pp. 68-70), The F₁ and F₂ Generations of a Sorghum × Johnson Grass Hybrid, by H. W. Bennett and P. G. Hogg (pp. 84-85), and Root Pressures and Injury to Cotton Roots by Cultivation, by O. A. Leonard (pp. 209-210) (all Miss. Sta.); The Effect of *Lespedeza sericea* on Soil Fertility, by B. P. Hazlewood (p. 44), *Lespedeza sericea* as a Silage and Hay Crop, by G. A. Shuey (pp. 44-45), and The Divergence in the Behavior of Limestone and Dolomite in Supplying Calcium and Magnesium, by W. H. MacIntire (pp. 76-77) (all Tenn. Sta.); Curing and Storage of Sweet Potatoes, by W. S. Anderson (p. 68) (Miss. State Col.); Some Observations on Soil Organic Matter, by H. R. Smalley (p. 70); Hairy Vetch as a Green Manure Crop for Cotton, by E. B. Reynolds (p. 71) (Tex. Sta.); Relation Between the Carbon Content of Soils Under Burning and Nonburning, by R. L. Donahue (p. 71) (Tex. A. and M. Col.); Soil Fertility Comparisons Between Leguminous Plant Material Incorporated With the Soil and Leguminous Mulches, by F. Moser (pp. 73-74) (S. C. Sta.); Uses of Soil Survey Data in a Regional Development Program, by G. A. Johnsgard (pp. 74-75); Soil Productivity in a Profitable Agriculture, by L. D. Baver (p. 75), and Comparison of Soil Tests, Tissue Analysis, and Seed Analysis as an Index of Soil Fertility With Peanuts, by E. R. Collins (pp. 78-79) (both N. C. Sta.); Soil Testing as a Basis for Making Fertilizer Recommendations, by I. E. Miles (pp. 75-76); Acid-Forming Fertilizer Not Supplemented With Limestone Prevents the Growth of Winter Legumes on Two Coastal Plain Soils, by J. H. Hunter and R. D. Lewis (p. 77); Results of Plant Tissue Tests and Soil Tests for Predicting the Fertilizer Requirements of Cotton and Corn, by L. C. Olson (p. 78), The Effect of Surface-Applied Phosphate and Limestone on Soil Nutrients and pH of Permanent Pastures, by O. E. Sell and L. C. Olson (pp. 80-81), The Relative Production of Roots, Rhizomes, Runners, and Leaf Shoots of Bermuda Grass Under Several Pasture Conditions, by O. E. Sell (pp. 85-86), and The Carotene Content of Sweet Potatoes, by H. L. Cochran (p. 181) (all Ga. Sta.); The Effect of Certain Natural Fertilizer Materials on the Growth of Turnips, by F. L. Wellborn, M. M. Phillippis, and S. S. Obenshain (pp. 79-80), and Time and Rate of Nutrient Absorption by Peanuts, by A. L. Grizzard and J. L. Strauss (pp. 81-82) (both Va. A. and M. Col.); Varieties and Methods of Planting Vetch for Seed Production, by H. R. Albrecht (p. 82), The Effect of Lime and Fertilizers on the Composition and Yield of Pasture Herbage From Different Soil Types, by J. W. McClendon and E. L. Mayton (pp. 88-89), and Factors Affecting the Cost and Rate of Drying of Sweet Potatoes by Natural Means, by L. M. Ware (p. 183) (all Ala. Sta.); Mode of Inheritance of Perigynous Heterotaxy and Associated Characters in Upland Cotton, by J. W. Neely and H. C. McNamara (p. 83) (U. S. D. A. coop. Miss. Sta.); Floret and Seed Types in Kentucky Bluegrass (*Poa pratensis* L.), by J. T. Spencer (p. 84) (Ky. Sta.); Experiments on Rate of Seeding *Lespedeza sericea*, by J. F.

Duggar (pp. 86-87) (Ala. Polytech. Inst.); Relative Yield and Shelling Properties of 18 Large and Small-Seeded Peanut Varieties and Selections When Grown in Virginia and South Carolina, by C. E. Steinbauer, E. T. Batten, and J. McCown (p. 182) (U. S. D. A. and Va. and S. C. Stas.); The Use of Electricity in Curing and Storing Sweet Potatoes, by J. B. Edmond and G. H. Dunkleberg (p. 182) (Clemson Agr. Col.); and Factors Influencing Flowering in Sweet Potatoes and Kudzu, by J. C. Miller (p. 211) (La. Sta.)

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, pp. 1, 2-3, 4, 6, 7).—Progress in current agronomic work is reported in articles entitled AAA Pasture Allowances Under New Program, by T. M. Patterson (p. 1); Drainage Highly Important Factor in Growing Vetch, by J. L. Anthony (pp. 2, 7); Moderate Use of Phosphate and Lime Recommended as Fertilizer for Vetch, by J. L. Anthony and J. Pitner (p. 2); Basic Slag Leads Super, Colloidal, for Vetch Growth, by C. D. Hoover (p. 2); and Phosphate More Than Doubles Pasture Yields—Sources Compared on Cost Basis, by H. W. Bennett (p. 7). This number also includes brief reports by C. Dorman on field crops work in the State, including breeding work with corn, potatoes, and sweetpotatoes; variety tests with cotton, corn and hybrids, oats, sweetpotatoes, soybeans, clovers, and lespedeza; cultural tests with soybeans, cowpeas, and sweetpotatoes; trials of Alyceclover; effect of soil preparation on distribution of cotton roots; storage, spacing, and slip production experiments with sweetpotatoes; fertilizer trials with sweetpotatoes, lespedezas, pastures, and summer and winter legumes; mowing of pastures and other pasture studies; and control of nutgrass and other weeds.

[Seed stock and cover crop studies] (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, pp. 8, 9, 11, fig. 1).—What the Control Fields Show About 1942 Seed Stocks, by L. E. Everson, reports on the merits of seed stocks of corn and oats offered for sale to New York farmers. Domestic Rye Grass—A New Cover for Vineyards, by T. A. Merrill, mentions the superiority of domestic ryegrass over other cover crops to replenish and maintain organic matter in vineyard soils. Differences in the control field behavior of seed stocks of red clover are noted briefly.

Green manure crops for soil improvement, D. W. THORNE (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 3, pp. 3, 9-10, figs. 2).—Alfalfa, sweetclover, vetch, small grains, and non-noxious weeds, according to station tests, are of value in supplying humus to Utah soils. Cultural practices are suggested.

Cover crops for soil conservation, W. V. KELL and R. MCKEE (*U. S. Dept. Agr., Farmers' Bul.* 1758, rev. (1942), pp. 11+14, figs. 10).—A revision of the publication noted earlier (E. S. R., 76, p. 179).

Regrassing areas in South Dakota, C. J. FRANZKE and A. N. HUME (*South Dakota Sta. Bul.* 361 (1942), pp. 48, figs. 13).—Measures to promote reestablishment of grass in locations in the three regressing areas of South Dakota are based on extensive experiments and observations. Important species are described and illustrated, with remarks on distribution and adaptation. Merits of many other species are also noted briefly.

The species adapted to conditions of growth within the specific area are limited largely to the native grasses, western wheatgrass, blue grama, buffalo grass, feather bunchgrass, side-oats grama, big and little bluestem, sand dropseed, Sandberg blue, and junegrass. Introductions found well adapted for many conditions include bluegrasses, smooth brome, crested wheatgrass, intermediate wheatgrass, and Russian wild-rye. Appropriate seeds-mixtures and rates, depths, and dates of seeding are shown for the grasses included in the three areas.

A firm seedbed has been found necessary for seeding grasses and residue covers for protection against wind erosion and soil incrustation. Drilling of grass seed has been better than broadcasting, because it places seed at an even depth with shallow covering. As a general rule, warm-season grasses should be seeded in the spring early to mid-May. Although optimum conditions for germination and growth of cool-season grasses are more difficult to determine, fall or early spring plantings should be made when conditions are favorable.

Range reseeding gives promise of increased feed supplies, A. F. BRACKEN (*Farm and Home Sci. [Utah Sta.], 3 (1942), No. 3, pp. 8-9, figs. 2*).—Spring-fall range in Utah, situated between winter-grazed deserts and summer-pastured forest lands, was originally largely covered with grass, but as a result of overgrazing and misuse, the grass has been replaced extensively by sagebrush, with great reduction in grazing capacity. On areas receiving 10-11 in. of rainfall, plowing up the sagebrush lands and broadcasting or drilling crested wheatgrass or other suitable grasses has corrected this condition. Other establishment practices are mentioned.

Better pasture and hay crops, G. H. AHLGREN and C. EBY (*New Jersey Sta. Cir. 448 (1942), pp. 7, figs. 6*).—The merits and adaptations of timothy, orchard grass, Alta fescue, tall oatgrass, brome grass, and reed canary grass, and alfalfa, red, alsike, and Ladino clovers, and birdsfoot trefoil for pasture and hay are described, with suggested seeding practices and seeds mixtures for situations differing in soil type, fertility, and drainage.

Continuous and rotation grazing of alfalfa-brome grass pastured with ewes and lambs, C. M. HARRISON, C. L. COLE, and H. C. RATHER. (Mich. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 6 (1941), pp. 303-308*).—Alfalfa and smooth brome grass mixture on 11 1-acre paddocks similarly limed and fertilized was grazed to test differences between a 4-field rotation, 3-field rotation, continuous, and second-crop grazing on weight gains or losses of the animals and pasture condition. At the end of a grazing season, acre gains differed very little with rotation or continuous grazing. Considering gains by plats based on weights when the sheep were moved in the rotation scheme resulted in absurdly crediting the one area in the rotation with gains out of proportion to anything that might be maintained over a grazing season. Season-long results rather than gains or losses on any one plat appeared to be the true test of a management plan. No advantage of pasturing a second crop of the mixture over that of continuous grazing where feed was ample in both cases was apparent. Appearance and quantity of forage on a pasture may result in misleading observations on livestock behavior in terms of weight gains or condition.

Fertility needs of dairy farm crops in the Connecticut Valley, F. S. PRINCE, P. T. BLOOD, and G. P. PERCIVAL (*New Hampshire Sta. Cir. 61 (1942), pp. 12*).—An experiment involving a rotation of corn followed by a hay seeding which was harvested 1938-41 was conducted near Claremont. The soil previously (E. S. R., 76, p. 469) had shown strong response to K in increased yield when applied to alfalfa and clovers.

Compared to legumes, corn (silage) responded much more to P than to K and made its largest yields on plats receiving manure with P (superphosphate). In a mixed clover-timothy seeding after corn, K stimulated yields most, due largely to clover which persisted on all K treatments. Timothy on these plats also made a larger growth. P used alone did not increase yields significantly, but with K the yield increase was more than twice as much as the increase due to K alone. Of the treatments, K alone gave the greatest return on the investment, while PK and complete fertilizer gave the highest returns per acre. This and previous tests suggest, on soils of this area, liberal treatment of corn with manure

and P. Hay crops after corn in the rotation should receive annually a PK mixture, with complete fertilizer or with properly supplemented manure, if yields are to continue at a high level. If red clover does not persist in the hay stand the farmer evidently has not kept available K at a high enough level, and commercial K should supplement the manure.

Plot technic studies with small grains, E. E. DOWN. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 472-481).—Fall-sown wheat and spring-sown barley plats were studied for five seasons to determine the plat width needed to overcome the influence of competition between contiguous nursery plats. Ten replications of competitive plats were alternated for two seeding rates and for two varieties for both grains, using plats 1, 3, 5, or 7 rows wide. The influence of competition did not extend significantly beyond the outside border rows of a plat. A 5-row plat for wheat and a 3-row plat for barley with border rows discarded at harvest appeared satisfactory for nursery investigations. A minimum of three replications for wheat and seven for barley was needed to reduce the standard error of the mean to 5 percent of the mean.

Fertilizer needs of alfalfa on New Hampshire soils, F. S. PRINCE, P. T. BLOOD, G. P. PERCIVAL, and P. N. SCRIPTURE (*New Hampshire Sta. Cir.* 58 (1942), pp. 12).—Fertilizer tests near Greenland, N. H., supported previous findings (E. S. R., 69, p. 502) indicating that alfalfa responds well to annual fertilizer treatments, and that liberal quantities of plant food used judiciously may give excellent returns. On the Whenal farm plats, elements used singly returned in increased hay produced for K \$3.72, N \$2.29, and P \$1.39 for each dollar invested in fertilizer. Plats receiving applications of all three elements annually outyielded untreated comparable checks 1.41 tons per acre each year, and the returns amounted to \$2.48 for each dollar invested in fertilizer. The increases for N, P, and K applied separately totaled 1.31 tons per acre. Two tons of ground limestone applied in 1926 plus 1 ton in 1933 proved as effective as 4 tons applied in 1926. In a trial with alfalfa on unmanured soil on the Ireland farm, 1936-40, elemental N up to 30 lb. per acre paid good returns, and even 30 lb. more was profitable, although much less effective in stimulating yields. Under test conditions, 750 lb. of a 4-16-16 or even an 8-16-16 fertilizer equivalent could profitably be applied. Applying all the P and K before seeding proved slightly superior to applying the same quantities in equal annual top dressings.

Growing field beans in humid areas, V. R. BOSWELL (*U. S. Dept. Agr. Leaflet* 223 (1942), pp. 8, fig. 1).—The main factors and operations involved in producing dry beans, i. e., climatic and soil needs, varieties and seeds, growing, harvesting, and handling the crop, and insects and diseases and their control, are outlined for growers in the eastern part of the United States.

The growing of sea island cotton in the Coastal Plain of Georgia, J. G. JENKINS. (Coop. U. S. D. A., Ga. Expt. Sta., et al.). (*Georgia Coastal Plain Sta. Bul.* 33 (1942), pp. 21, figs. 11).—Cultural and field practices and harvesting, ginning, and boll weevil control methods involved in growing sea-island cotton are described, with comments on marketing the crop. Emphasis is placed on planting pure seed (E. S. R., 77, p. 777), its maintenance and distribution, roguing seed fields, and advantages of one-variety communities in maintaining purity. Dosages for seed treatment are recommended, and a home-made treater is illustrated.

Peanut production in the Coastal Plain of Georgia, S. A. PARHAM (*Georgia Coastal Plain Sta. Bul.* 34 (1942) pp. 19, figs. 6).—Information given on varieties of peanuts, soils and their preparation, fertilizers, seed and planting, cultivation and harvesting practices, hogging-off, and insects and diseases and their control is based extensively on prolonged experiments at the station and on experience

of growers. Practices indicated from the experiments include 200-400 lb. of fertilizer on thin land or after unfertilized crop, 2-10-4 or 2-10-6 formulas, and planting in hills 6 in. apart in from 24- to 30-in. rows between March 15 and May 1 for Spanish and from 8 to 12 in. apart in from 36- to 42-in. rows and after March 15 to April 15 for North Carolina Runner peanuts.

Potato production in the Southern States, E. L. LECLEBERG (*U. S. Dept. Agr. Farmers' Bul.* 1904 (1942), pp. [2]+44, figs. 32).—The practical information given on cultural and fertility needs of potatoes grown in the South, seed treatments and planting practices, harvesting and storage, potato diseases and insects and their control, and production centers and potato varieties grown in the several Southern States supersedes and enlarges on that in Farmers' Bulletin 1205 (E. S. R., 45, p. 234).

Sweet potato investigations in New Jersey, V. A. TIEDJENS and L. G. SCHERMEHORN (*New Jersey Stat. Bul.* 697 (1942), pp. 20, figs. 12).—Cultural and fertilizer (E. S. R., 84, p. 182) experiments in field and greenhouse, 1928-41, showed that substantial yield increases may follow certain practices, including use of a starter solution on plant beds after first plants are pulled and good-sized vigorous plants, setting plants with a starter solution, keeping dry fertilizer away from the roots, applying from 300 to 500 lb. of pulverized Mg limestone per acre in the bottom of the plowed furrow on soils with a pH of 5.0 or less, mulching on gravelly or light sandy soils, and harvesting after September 20, if possible.

The method of applying fertilizer in water was found more dependable than any dry methods used, which weather conditions may make hazardous. In dry seasons row applications of dry fertilizer reduce yields by burning the plants, and in wet years such heavy vine growth is produced that the crop falls to mature before frost. The most effective methods of fertilizer placement, in the order of their value, are (1) set plants with starter solution and side dress with 100 lb. of 13-26-26 in 200 gal. of water per acre 2 weeks, and again from 3 to 4 weeks later; (2) set plants with starter solution and side dress with 400 lb. of 3-12-15 dry fertilizer 2 weeks, and again 5 weeks later; and (3) broadcast and plow under 800 lb. of 3-12-15 and set plants with starter solution (this method requires the least labor).

Cooperative tests of sweetpotato varieties, introductions, and seedlings for starch production and market purposes, C. E. STEINBAUER, L. L. HARTER, G. P. HOFFMAN, J. M. MCCOWN, R. M. KINGSBURY, W. S. ANDERSON, and H. T. COOK. (Coop. Miss., Va. Truck, and S. C. Expt. Stas.). (*U. S. Dept. Agr. Cir.* 653 (1942), pp. 42, pls. 6).—Results of cooperative studies, 1934-39, in Maryland, Virginia, South Carolina, and Mississippi on the appearance, yields, starch production, wilt resistance, market quality, and other characteristics of numerous varieties, introductions, and seedlings of sweetpotatoes are reported. Important characters of 13 well-known American varieties and 26 other sorts are tabulated.

Big-Stem Jersey, Nancy Hall, Pierson, Porto Rico, Red Bermuda, Southern Queen, Triumph, Vineland Bush, Wennop, Yellow Jersey, 24171, B-33, and B-52 made definitely superior yields at two or more locations, although not always at all places. Certain varieties, as Japanese Yam, Oebi Saboelan, Kloranda Dutch Yellow, Red Brazil, and Vineland Bush, yielding exceptionally well at Beltsville, Md., yielded rather low in certain locations in the lower South. The reverse of this situation was noted with a few other sorts, as Southern Queen and Triumph. This observation indicated a rather definite regional adaptability among certain varieties, although many are consistently high producers within the area in these studies. Kloranda Dutch Yellow, Japanese Yam, Norton, Oebi Saboelan, Pierson, Red Bermuda, Red Brazil, Southern Queen,

Triumph, Wenholz 2, Wennop, Yellow Strasburg, 029878, and B-33 showed high or very good starch percentages and yielding capacity enough to make them appear desirable for commercial starch manufacture. Within this group seedling B-33 has been most promising. Excessive production of latex in Wennop might interfere with its use for commercial starch recovery. Varieties including most of the sweetpotatoes currently used for market (culinary) purposes were not among the sorts appearing most promising for starch manufacture. Determinations of stem rot, or wilt, susceptibility in field and greenhouse indicate that many varieties and seedlings studied have at least moderate resistance to this disease. Although many sorts appeared relatively poor as market or starch-yielding sweetpotatoes, certain ones, because of high starch percentages or of outstanding resistance to stem rot infection, may be valuable as parent stocks for breeding.

The effects of carbon disulphide upon germination and baking quality of wheat, H. S. SMITH and H. W. STATEN (*Oklahoma Sta. Tech. Bul. 14* (1942), pp. 13, figs. 6).—When samples of Turkey wheat were treated with different amounts of CS₂ for different periods, no significant differences in germination were found until concentrations greater than 4 times the rate recommended for insect control, about 4 gal. per 1,000 bu., were applied. Percentage of germination decreased rapidly when amounts equal to 20 times the normal rate were used. Effects due to duration of treatment were not apparent until concentrations heavy enough to affect germination were used, after which a significant difference was found between 1 and 2 days' treatment. Three- or 4-day treatment periods did not result in lower germination. With the higher concentrations greenhouse germination exceeded that in the germinator. Baking quality was reduced at the same concentration which lowered germination. Applications decreasing germination percentage all had adverse effects upon loaf volume, dough character, crust color, grain, and texture.

[Seed investigations] (*New York State Sta. Rpt. 1942*, pp. 75-76, 78, 79).—Brief reports are made on the general merits and characteristics of official samples of field crops, vegetable and flower seeds, and special seed mixtures; responses for peas, beans, corn, and oats to treatment with hormones; and germinative characteristics of flower seed.

HORTICULTURE

Practical applications of plant growth-substances in horticulture, F. E. GARDNER. (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 20-26).—With a view to assisting Florida growers, the author points out the various plant responses that have been obtained from applications of growth substances and discusses some of the applications which have been developed therefrom. Information is presented on the timing of preharvest sprays for reducing dropping of the Pineapple orange and on the effect of growth substances on the solids and acid contents of Pineapple and Valencia oranges.

A grating spectrograph for mineral nutrition studies, R. C. NELSON. (Minn. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 3, pp. 492-496, figs. 2).—A description is given of an inexpensive spectrograph utilizing a concave diffraction grating replica to disperse light. The apparatus proved satisfactory for the analysis of plant ashes, being both rapid and economical in operation.

Influence of ice upon temperatures in air-cooled storages, C. E. BAKER. (Ind. Expt. Sta.). (*Ind. Hort. Soc. Trans.*, 1942, pp. 81-84).—Temperature records taken in three locations, (1) outdoors, (2) ventilated storage room, and (3) ice-and-salt-cooled room, showed very definitely the beneficial effect of icing.

In many of the autumn weeks the average temperature was actually higher in the air-ventilated room than outdoors. The iced room was approximately 20° F. cooler than either of the other two locations, and this lower temperature, though not ideal, was reflected in the better condition of the apples. Additional information is contained in the discussion of this paper.

[**Horticultural studies by the Mississippi Station**] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, p. 4).—Brief information is presented by C. Dorman on the following studies: Spacing and fertilizer trials with cucumbers; variety and cultural tests with tomatoes; variety and strain trials with pole beans; variety tests of sweet corn, peaches, plums, apples, and pears; and the use of low temperature for breaking the rest period of the azalea.

Small fruits and vegetable varieties for irrigated central Washington, W. J. CLONE. (Wash. Expt. Sta.). (*Wash. State Hort. Assoc. Proc.*, 37 (1941), pp. 69-78).—Information is presented on fruit characters, growth habits, yielding capacity, season of maturity, etc., of a large number of varieties of fruits and vegetables.

[**Vegetable studies by the New York State Station**] (*New York State Sta. Rpt. 1942*, pp. 68-69, 74, 80-86).—Included are reports upon the use of X-rays in tomato and bean breeding; the development of disease-resistant and improved varieties of squashes; fertilizer placement; soil requirements of canning peas; use of starter solutions; fertilizer requirements of the tomato; comparison of various nitrogen fertilizers and inoculation for peas; plant tissue tests in relation to fertilizer needs; strain tests, culture, and breeding of sweet corn; testing of new varieties of peas for canning and freezing; squash and muskmelon breeding; selection of vegetables for dehydration value; improvement of canning beans; and the testing of tomato varieties.

Fall and winter gardens needed to supply war foods, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, p. 7).—Information is presented on desirable vegetables for fall planting, the importance of good culture and fertilization, and the control of insects and plant diseases.

The vegetable seed plantings, B. E. CLARK (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, pp. 8, 11).—Brief comments are presented upon the results of field trials of cucumber, eggplant, onion, and pepper seed stocks. The cucumbers and eggplants were generally true to name and of good quality, while the onions and peppers varied greatly and were frequently of very low quality.

Station explores possibilities of vegetable seed production in Utah (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 3, p. 12, fig. 1).—Information is presented on new investigations in cooperation with the U. S. Department of Agriculture by M. Shapovalov and L. H. Pollard, designed to reveal possibilities in vegetable seed production, particularly table beets and carrots.

The influence of starter solutions on lettuce and celery seedlings on the Everglades muck, F. S. ANDREWS. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 127-130).—Without exception the yields of all lettuce plats receiving starter solutions were higher than those transplanted with water alone. The average increase was 71 crates per acre. However, in a later planting on a more fertile soil there was no evidence of a marked increase in yield growth due to starter solutions. In the case of celery, one planting showed little stimulation from starter solutions while a second planting did show some significant benefit.

Snap beans for marketing, canning, and freezing, B. L. WADE (*U. S. Dept. Agr., Farmers' Bul. 1915* (1942), pp. [2]+14, figs. 3).—General information is presented on the adaptability of the bean crop, varieties, cultural require-

ments including fertilizers, grading and marketing, control of diseases and insect pests, etc.

Chemical factors influencing the set of Henderson lima beans, B. WOLF (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 7, pp. 646-650).—Marked differences were recorded in the chemical content of well- and poorly set plants. The former had substantially higher concentrations of nitrate N, K, available Ca, and Mg but less available P than poorly set plants. The concentrations of nitrate N and of available Ca in the main stems were closely associated with seed set. Results of analyses of the soil beneath the plants indicated that soil pH values, available P, K, and Mg were not limiting in this study. Organic matter had a beneficial effect upon set and yield. There was slightly more Ca in the soil collected beneath the well-set plants.

The viability of lettuce seed: A physiological and microchemical study, A. E. GRIFFITHS ([New York] *Cornell Sta. Mem.* 245 (1942), pp. 39, figs. 8).—Work with several varieties of lettuce seed showed an important interrelationship of moisture content and of temperature in maintaining viability. The decline in viability was more rapid at high temperatures when the seed moisture was above the critical moisture content, which was usually slightly below the air-dry moisture content but varied with the sample, the variety, and the region where the seed was produced. The critical moisture content of most of the seeds used in the study ranged from 3 to 5 percent. The air-dry water content of seeds ranged from 6 to 7 percent of the oven-dry weight. Within limits, the moisture content of lettuce seed varied with the relative humidity of the atmosphere.

Seeds of the New York variety were not killed as quickly under conditions of high temperature and high moisture as were those of the Grand Rapids variety. This difference was due to a lower rate of moisture absorption by the seeds of the New York variety, a situation which, in turn, was attributed to the presence of a highly suberized membrane surrounding the embryo. The acidity of the embryos remained the same in dormant seeds as in nondormant seeds during storage. At 60° C., the excised embryos were killed more rapidly than whole seeds when both were moist. When dry however, excised embryos and entire seeds were killed at about the same rate. From the standpoint of accuracy in determination of the moisture content of lettuce seeds, a temperature of 80° in vacuo gave results that appeared least subject to further fluctuations with time. A temperature of 60° in vacuo did not remove a sufficiently large percentage of the free water before the results were affected by oxidation.

Progress report on investigations in the production of iceberg lettuce, J. R. BROKENBACH. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 121-125, figs. 3).—Grown on raised beds with centers about 40 in. apart and two rows per bed, lettuce plants were spaced at different intervals in the rows. With all spacings cutting well over 90 percent, it was found that the wider-spaced plants cut much more heavily in the first two cuttings, and in direct ratio to their spacing within the row. The wider the spacings, the larger were the heads. Nitrogen studies indicated that not less than 60 lb. per acre are needed, and not more than 100 lb. are desirable. Sulfate of ammonia proved to be a satisfactory source of nitrogen.

A method of statistical analysis of a factorial experiment involving influence of fertilizer analyses and placement of fertilizer on stand and yield of cannery peas, J. F. DAVIS, R. L. COOK, and W. D. BATEN. (Mich. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 6, pp. 521-532, figs. 2; *abs. in Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, p. 74).—The

results of an experiment to determine the effect on the yield and stand of canary peas of different fertilizer mixtures, placed in various locations with respect to the seed, showed that the placement of fertilizer is exceedingly important. The need was indicated for separating the sum of squares for treatments into their various components in order to arrive at a full and correct interpretation of the data. A complete fertilizer placed in contact with the seed at the rate of 300 lb. per acre on a Brookston loam reduced significantly the stand and yield. When a 0-20-0 or a 0-16-8 material was used, yield alone was reduced. The plats receiving the 0-16-8 material yielded as well as did those receiving the 4-16-8 and produced significantly larger yields than those on which a 0-20-0 material was used. There was no significant difference in yield between plats on which the fertilizer was applied in bands 0.5 in. to the side and 1.5 in. below the seed and in plats in which the fertilizer was placed 2 in. to the side and 1.5 in. below the seed.

Experiments with greenhouse tomatoes: Varieties, cultural methods, and relationship between yield and vegetative vigor, F. A. ROMSHE (*Oklahoma Sta. Bul.* 260 (1942), pp. 30, fig. 1).—Of seven varieties of tomatoes tested in four crops, Michigan State Forcing and Forcing Marglobe were found most desirable for greenhouse production in Oklahoma. Plants spaced 24 by 21 in., 3.5 sq. ft. per plant, yielded more tomatoes per square foot of area than did wider spaced plants. Training plants to a single stem was found more satisfactory than training to two stems. The fresh weight of tomato leaves grown under conditions of the experiment was found to be an accurate measure of leaf area. No consistent relationship was found between leaf area and yield with plants set at the various spacings and arrangements used. Correlations between plant stem diameters and the number of flowers, number of fruits, and weight of fruit per cluster varied considerably for the different crops and varieties. Proper management to maintain fairly vigorous, vegetative growth, as indicated by the diameter of the stem, is needed to maintain good production over an extended period of time.

Effect of potassium iodide on the ascorbic acid content and growth of tomato plants, R. H. HAGERMAN, E. S. HODGE, and J. S. MCHARGUE. (*Ky. Expt. Sta.*). (*Plant Physiol.*, 17 (1942), No. 3, pp. 465-472, figs. 3).—Observations on tomato plants grown in sand cultures containing potassium iodide in concentrations ranging from 4 to 100 p. p. m. of iodine showed no reduction in growth (as measured by dry weight) at the 4 p. p. m. concentration. With 16 p. p. m. or more of iodine, growth was seriously injured and production was curtailed. Injury was evidenced by a loss of green color in the plants, necrotic edges of the lower leaves followed by curling, and death. The injury moved progressively upward from branch to branch. All concentrations of potassium iodide caused a marked decrease in ascorbic acid content of the plants. Manganese and copper uptake by the treated plants was more pronounced than any of the other mineral constituents.

[Pomological and floricultural studies by the New York State Station]. (Partly coop. U. S. D. A. et al.). (*New York State Sta. Rpt.* 1942, pp. 61-63, 64-68, 69-73).—Herein are reported progress reports on fertilizer experiments with apples, peaches, and plums; cultural studies with the Montmorency cherry; culture of blueberries on different soils; fertilizer requirements of the strawberry and raspberry; application of nutrients in the form of sprays; the testing of fruit varieties; the breeding of new and improved fruits; cytological studies with snapdragons, *Tradescantia*, and *Trillium*; testing of chemicals other than colchicine for their effect on cell division and growth; X-ray effects on *Tradescantia* chromosomes; testing of dwarfing and seedling rootstocks for apples; the use of

intermediate body stocks to reduce winter injury in the apple; time interval between full bloom and fruit ripening; histology and development of apple fruits; chemical changes in developing peach fruits; rootstocks for grape varieties; pruning and fertilization of grapes; and the testing of varieties of hops.

Propagation of trees and shrubs by seed, M. AFANASIEV (*Oklahoma Sta. Cir. 106* [1942], pp. 43, pls. 8).—Dormancy in seeds is due to various causes, two of the most important of which are impermeability of the seed coat to water and dormancy of the embryo. Methods of breaking dormancy are sulfuric acid, hot water, and scarification treatments, followed by stratification. Specific information is given on the handling of a large number of tree and shrub seeds.

The home fruit garden in the Northeastern and North Central States (*U. S. Dept. Agr. Leaflet 227* (1942), pp. 8, figs. 2).—This is one of a series (*E. S. R.*, 87, p. 670), designed to aid in the selection of varieties, planting, and care of fruits.

Forecasting the time of fruit harvest by blooming dates, H. B. TUKEY (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, pp. 3, 11, fig. 1).—A study of bloom and harvest records accumulated over a period of years showed that the interval between full bloom and fruit maturity is very constant from year to year for a given variety. The apple was more consistent than any of the other fruits studied. Within a given species, there was apparently a greater variation in the bloom-maturity interval in early-maturing than in late-maturing varieties. The author suggests that growers, by keeping records, may obtain information which should be useful in planning their orchard operations.

1941 experiences with sprays to delay fruit drop, C. L. BURKHOLDER and M. McCOWN. (*Ind. Expt. Sta.*). (*Ind. Hort. Soc. Trans.*, 1942, pp. 13-19).—In 1941 preharvest sprays were effective in delaying the dropping of Delicious apples, thus affording opportunity for better coloring and lengthening the harvest season. In view of the labor shortage, the extended season for picking was very helpful. Good results were obtained with Rome Beauty and Winesap trees on the Indiana Station farm at Bedford. Here the use of chemicals returned a substantial profit above costs. Fruit drop control sprays gave good results on Delicious, Rome Beauty, and Winesap, but had little beneficial effect on Grimes Golden, McIntosh, and Jonathan. Additional information is continued in the discussion of this paper.

Further studies with certain chemicals to prevent fruit drop and increase red color, E. L. OVERHOLSER, F. L. OVERLEY, and D. F. ALLMENBINGER. (*Wash. Expt. Sta.*). (*Wash. State Hort. Assoc. Proc.*, 37 (1941), pp. 79-85, fig. 1).—In this further discussion (*E. S. R.*, 85, p. 481), evidence is presented that varieties differed in their response to preharvest sprays, especially in the effective period following application. The period of effectiveness began usually 2 to 3 days following spraying and lasted for 9 to 10 days with McIntosh but for 2 to 3 weeks or more with the other varieties tested. If low temperature prevailed following spraying a longer period was required for the spray to become effective, but the effective period might be somewhat longer. The use of spreaders or oil appeared to increase slightly the effectiveness of preharvest sprays. A concentration of 10 p. p. m. appeared nearly correct. There was no apparent effect of preharvest sprays on fruit maturity or storage behavior. Although α -naphthylisothiocyanate sprays improved the color of apples slightly, their use is not yet recommended commercially.

The Atchison Experiment Orchard, R. J. BARNETT (*Kansas Sta. Bul. 301* (1942), pp. 31, figs. 8).—A descriptive account is presented of the site, plan, and operation of an experimental orchard located about 10 miles south of Atchison, Kans., and operated under lease by the station from 1932 until

1941. In 1940 a disastrous November freeze ruined many of the trees and forced the termination of the investigations. Of the four varieties of apple—Winesap, Jonathan, Richared Delicious, and Grimes Golden—planted in the orchard, Winesap was first to come into bearing and was the heaviest producer in each of the three cropping seasons. In training experiments there was some evidence that four framework branches are too many to leave on apple trees which have been grown the second year in the nursery. An interplanting of corn decreased the wind effect and permitted easier training to the desired form. Of five systems of soil management tested, namely, red clover sod, winter vetch, cowpeas, corn intercrop, and straw mulch, the last was most effective as measured in gain in trunk diameter and annual growth. In the straw mulch area more trees survived, were larger in size, and bore more fruit. The value of straw mulch was probably increased by the fact that some of the hottest and driest weather ever recorded in Kansas occurred during the lifetime of the experiment.

Effect of orchard fertilizer applications on the composition of apples, J. L. ST. JOHN, E. L. OVERHOLSER, and F. L. OVERLEY. (Wash. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 3, pp. 435-446).—Studies upon the mineral and carbohydrate composition of Jonathan and Winesap apples harvested from plats receiving beneficial fertilizer treatments showed, in general, that the effects of different fertilizers on fruit composition were relatively small. Increases in terminal growth and fruit production opposed increases in percentages of N, P, and K in apples as a result of fertilizer applications. Since increases in growth and production resulted primarily from added N, applications of N, alone or in combination, resulted usually in reduced percentages of N, P, and K in the fruits. Variations in the sugar content of the fruit were somewhat larger in relation to the total amount of sugar present than was the case with the minerals. These variations were not consistent when considered in the light of variations from year to year and of natural sample variations. Since there was no evidence of a deficiency of either P or K in the soils involved, the authors conclude that the effects might have been more marked if the trees had been growing in the presence of a deficiency of one or both of these elements.

Russetting of Golden Delicious apples, F. B. CHANDLER and I. C. MASON. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 120-122).—Observations on fruits of 25 Golden Delicious trees which had been sprayed with lime-sulfur, mild lime-sulfur, and calcium arsenate with lime, but never with copper materials, showed a range in percentage of russetting from 30.6 to 100 percent, according to individual trees. Scions taken from high- and low-russet trees and grafted into other trees tended to perform as did the original parents, thus indicating that the scions carried an inherent factor, possibly a bud mutation, that influenced russetting behavior. However, there was evidence that environmental factors, such as soil, rootstock, and understock, were also involved. The application of boron to certain of the high-russet trees failed to affect the amount of russetting. A climatic influence was noted which in some years caused apparently a higher than usual percentage on all the trees.

Methods of handling Elberta peach pits in relation to nursery germination, W. H. UPSHALL (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 279-282).—In 9 of 12 yr., nonshelled Elberta peach pits bedded in soil for 1 yr. and then thinned in the nursery row gave fair to good stands of seedlings the following spring. In the other 3 yr. practically all of the viable pits germinated in the bed the first spring, leaving wholly or largely worthless pits. In such in-

stances a satisfactory stand of seedlings was obtained the following spring by cracking, in mid-April, of pits of the preceding year's crop which had been put in the soil bed as soon as the flesh was removed.

New peach varieties, M. J. DORSEY. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 75 (1941), pp. 343-352).—Among new varieties of peaches Redhaven, developed by the Michigan Experiment Station, was found outstanding. Several promising peaches developed by the Illinois Station, but still carried under breeding numbers, are described, and some of these are expected to become important factors in peach production in the State. Some information is presented on carlot shipments of peaches in 1941.

Observations on the inheritance of horticulturally important characteristics in the highbush blueberry, S. JOHNSTON. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 352-356).—The author points out desirable bush and fruit characters in the blueberry and from observations on seedling progenies of various crosses evaluates the potentialities of certain named varieties in breeding for these desirable characteristics. For example, Rubel transmitted upright growth, large size of bush, light blue color, firmness, and late ripening of fruit. For large size of berry, Pioneer was the best parent. Adams yielded early-maturing seedlings. Pioneer and Harding gave sweet flavor to their seedlings. All varieties transmitted easiness of picking.

The effect of mulch on soil moisture, soil temperature, and growth of blueberry plants, F. B. CHANDLER and I. C. MASON. (Maine Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 335-337, figs. 2).—Based on investigations in Maine conducted on sandy loam at Monmouth, clay loam at Cherryfield, and a highly sandy soil at Deblois, the authors conclude that mulch retains soil moisture, maintaining the average above that resulting from clean culture. Mulches decreased the average soil temperature during warm weather, increased the growth of blueberry plants in clay loam soil, and reduced their growth in sandy soil.

Lower temperature cranberry storage tests to reduce loss, C. I. GUNNESS. (Mass. Expt. Sta.). (*Cranberries*, 7 (1942), No. 5, pp. 7, 10).—Of various temperatures employed in the storage of cranberries, 35° F. was found most satisfactory from the standpoint of reducing losses. However, in the case of poorly colored berries 45° was more satisfactory because the berries developed better color at that temperature. Above 50° there was little change in color, and the losses were markedly increased. The economic aspects of cranberry storage are considered.

"Milton"—a new red raspberry, G. L. SLATE (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, pp. 7, 9).—Milton, obtained from a cross between Lloyd George and Newburgh, is described as to plant and fruit. The variety is being introduced as a probably mosaic-free late variety for commercial and home use.

Studies on some raspberry soils of British Columbia, H. J. ATKINSON and L. E. WRIGHT (*Sci. Agr.*, 22 (1942), No. 5, pp. 287-297).—A study of soil samples collected from areas which showed varying levels of growth of raspberries failed to show any correlation between the organic matter content and water-holding capacity and growth. Boron content was apparently important since samples from all areas showing good growth had higher boron contents, with the highest boron from the field where excellent raspberry growth occurred. A part of each soil sample was sterilized and analyzed. As a result of sterilization the solubility of organic matter was noticeably increased, as were also the contents of water-soluble sulfates and exchangeable manganese.

The use of seed characters in the identification of grape varieties, H. P. OLMO. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 305-309).—

Studies with three varieties of grapes—Carignane, Alicante Bouschet, and Burger—grown at Glen Ellen, Calif., without irrigation and at Davis with irrigation showed that the seeds are useful in variety identification and have the added advantage over fruit in that they may be stored in a permanent collection for study at any convenient time. The mature seed, as judged by weight, length, and width measurements, is far more constant than any of the other fruit characters commonly used in variety descriptions. Although length of seed may increase appreciably with increased size of berry, the width remained fairly constant under the two environments. The use of a ratio of length to width is not warranted because the two factors do not respond in the same manner to changes in environment.

The performance of Champlel grapes under different pruning treatments, N. H. LOOMIS. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 310-312).—The yields of own-rooted Champlel grapes grown at Meridian, Miss., were significantly increased by spur pruning as compared with cane pruning. Pinching the new crop just beyond the last blossom cluster at the time of bloom increased significantly the weight of the clusters. There was no significant difference in yield between pinching and no pinching with respect to vine yields, nor any significant difference between spur and cane pruning as measured by fruit cluster weights.

Plant breeding possibilities for southern Florida, H. S. WOLFE. (Univ. Fla.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 144-146).—Possibilities in the improvement of the avocado, peach, persimmon, jujube, papaya, annona, sapodilla, and other fruits by breeding and selection are discussed.

New avocado varieties, S. J. LYNCH. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 142-144, pls. 4).—Descriptions and comments are given on certain new varieties, such as Hickson, Herman, Bonita, Lindgren, Blair, and Harris.

Juice color and quality in certain varieties of Florida citrus fruits, E. V. MILLER and J. R. WINSTON. (U. S. D. A.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 64-67).—The total carotenoid pigments in the juice of Florida oranges were observed to increase with their maturity. Since certain of these pigments are converted to vitamin A in the animal, it is concluded that vitamin A potency also increases with ripening. Mandarin oranges, which are notably low in ascorbic acid, are relatively high in carotenoid pigments. A greater use of highly pigmented oranges for human and animal consumption is recommended with respect to vitamin A supply.

Early diagnosis of magnesium deficiency in Florida citrus, B. R. FUDGE. (Fla. Expt. Sta.). (*Citrus Indus.*, 23 (1942), No. 9, pp. 1, 4-5, 14, figs. 4).—The possibility of determining, by analysis of the early spring foliage, the probability of Mg deficiency 4 or 5 mo. later was indicated. If the Mg content of the moisture-free spring flush foliage was greater than 0.35 percent in April and soluble Mg to the extent of 2-4 units of MgO is contained in the summer fertilizer along with 3-4 units of N, the experiment indicated that no deficiency of Mg would occur that autumn. When the first visual symptoms of Mg deficiency appear, it is too late to apply Mg fertilizer with the hope of preventing further development of leaf injury.

The mineral composition of citrus juice as influenced by soil treatment, B. R. FUDGE. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 4-12).—Analyses of foliage and fruit from some 50 groves located on soils differing widely in chemical composition indicated that differences in the composition of the juice are much smaller than the differences found in the soil or in foliage composition. The Ca content of the juice of fruits grown on hammock

soils was significantly higher than that of juice of fruits grown on sandy soils, but the difference was not so marked as in the foliage. K was slightly higher in the juice of fruit grown on sandy soils, whereas the P and Mg contents were about equal. Essentially, fruit from hammock groves could not be considered as having any great advantage for animal nutrition. The large supply of exchangeable Ca found in the soil as a result of applying CaCO₃ or dolomite was not reflected in the Ca content of the juice. The amount of Mg found in the juice of both oranges and grapefruit was apparently increased to a considerable degree where there was a large supply of exchangeable Mg in the soil. The large amounts of materials that must be applied to the soil to produce relatively small increases in mineral composition of the juice are not considered warranted in practical culture. Essentially, cultural practices that produce and maintain vigorous trees should give the best quality fruits.

The effect of certain fertilizer practices on the time of maturity and composition of grapefruit and oranges, F. F. COWART and C. R. STEARNS, JR. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 12-19).—The application of Mg, Cu, Zn, and Mn to trees on a great many of the Florida soils devoted to citrus resulted in marked improvement in fruit quality, along with a general betterment in tree vigor and production. The time of maturity of grapefruit was not materially affected by these elements. A probable slight delay in maturity of the Pineapple orange was indicated. The application of the four above-named elements, particularly Mg, improved the quality of Pineapple oranges as measured by increased acidity, total solids, sugars, and vitamin C contents. In the absence of Mg, the other three elements, Cu, Mn, and Zn, improved quality, but their effects were apparently masked by the beneficial effect of Mg on tree growth and production.

Weekly absorption of nitrate by young, bearing orange trees growing out of doors in solution cultures, H. D. CHAPMAN and E. R. PARKER. (Calif. Citrus Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 3, pp. 366-376, figs. 3).—Records taken over a 3-yr. period on the weekly nitrate absorption by two young bearing Valencia orange trees growing outdoors in complete nutrient solutions showed the period of maximum absorption to be that of late spring, summer, and early fall. The least absorption occurred during January and February. The periods of varying absorption were related to solution and air temperatures, but varied widely at times even when temperature was rather constant. The relation between the quantities of nitrate and of water absorption was rather variable from week to week, with indications that nitrate absorption was more closely related to periods of active root growth and water absorption to cycles of active top growth.

"Puffy" tangerines in the packing house process, C. K. CLARK and C. R. STEARNS, JR. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 54 (1941), pp. 45-52).—Studies of the nature, cause, and prevention of damage of puffy tangerines, brought about in various packing house operations, showed that curing by heating had no merit, in fact even 80° F. caused a material increase in damage. The number of treatments to which such fruit are subjected should be reduced to a minimum, leading to the practical suggestion that simply washing with soap, rinsing, and drying on a roller conveyor would appear to be the best method of handling puffy fruits.

Studies of the root system of *Coffea arabica* L.—III, Growth and distribution of roots of 21-year-old trees in Catalina clay soil, J. GUISCARFÉ-ARBILLAGA and L. A. GÓMEZ (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 26 (1942), No. 2, pp. 34-39, figs. 2; *Span. abs.*, p. 38).—Continuing this investigation (E. S. R., 84, p. 764), data presented on the distribution of roots of six 21-year-old coffee

trees growing in Catalina clay soil showed 94 percent of the roots to occur in the uppermost foot. Primary, secondary, and tertiary roots comprised 57.22, 25.72, and 17.06 percent of the whole root system, respectively. The top:root ratio was 4:1.

The Croisic (Cordelia) fig, I. V. CONDET. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 255-258).—The author discusses the history, nomenclature, distribution on the Pacific coast, fruiting behavior, and flower structure of the Croisic fig, so named in France in 1882 but called Cordelia in California. It is said to be essentially a caprifig, producing ordinarily a heavy proficli crop, a light mammoni crop, and very few or no mammee figs. Blastophagous insects oviposit in the short-styled pistillate flowers, and all stages of the insect may be found in the syconia at various times.

Effect of stratification and time of planting on germination of tung seed, R. H. SHARPE and S. MERRILL, JR. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 286-291, fig. 1).—Stratification of hulled tung seeds was of definite aid in hastening and improving germination, especially so with seed from parent trees whose seeds germinate slowly. Stratification of whole fruits resulted in much poorer and slower germination than when the seeds were hulled. January planting proved better than March planting of dry-stored seeds, but did not particularly benefit stratified seeds. Stratification thus permitted later planting, with better weed control. Moderately cold temperatures gave better results in stratification than did cold storage temperatures.

Preliminary storage experiments with pollen of tung (Aleurites fordii Hemsl.), D. L. FERNHOLZ and L. HINES. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 251-254, figs. 2).—Pollen of tung (*A. fordii*) germinated readily on 1 percent agar with 10 percent sucrose when incubated 24 hr. at room temperature in a practically saturated atmosphere. Pollen taken from buds collected just before anthesis gave the best viability and longevity. Storing whole flowers in paper bags at about 5° C. (41° F.) in an ordinary household refrigerator was found a practical method for keeping pollen for breeding operations.

Michigan State: A new hybrid Kalanchoe, C. E. WILDON (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 29-32, pl. 1).—A description is presented and the cultural requirements outlined of a new hybrid obtained from a cross of *K. blossfeldiana* × *K. kirki* (= *velutina*).

Adaptability studies with bearded iris in Texas, S. H. YARNELL (*Texas Sta. Bul.* 615 (1942), pp. 33, figs. 5).—A total of 582-odd varieties of bearded iris was tested for adaptation when grown on a Lufkin fine sandy loam. Of the total, 149 received a rating of 7 or better, which represented good adaptation. Of the 149, 1 was rated excellent in adaptability, 15 rated very good, 44 good, and 89 moderately good. Recent introductions were found to be about as well adapted to the conditions of the test as were the older varieties and provided a wider range of color. Varieties which had proved to be generally good elsewhere had a better-than-average chance of being well adapted to the Texas conditions. Under the existing conditions at College Station, November through December, when there was ample moisture, was found the best time to transplant iris. April, May, and June proved to be the most unfavorable time. When moisture conditions 1 week before and 5 weeks after setting were good, the plants thrived much better than when the soil was dry. In 14 crosses where adaptability ratings were available for both parents, the offspring averaged higher in rating than the parents. Varieties with somatic chromosome numbers of 24, 36, 40, and 44 averaged better in adaptability than those with 47 to 50 chromosomes. The result was attributed to a lack of factors favoring adaptability rather than to the high chromosome numbers.

FORESTRY

[Forestry studies by the New York State Station] (*New York State Sta. Rpt. 1942*, pp. 78-79).—Brief reports are presented upon germination studies with coniferous seed, sulfuric acid treatment of the hard seeds of certain forest species, and the testing of planting stocks of Scotch pine and Norway spruce.

Trees of the eastern United States and Canada: Their woodcraft and wildlife uses, W. M. HARLOW (*New York and London: McGraw-Hill Book Co., [1942], pp. XIII+288, pls. [5], figs. [163]*).—This descriptive manual (with keys to tree groups and species), prepared especially for hobbyists, hikers, campers, and woodcrafters, approaches the subject with a minimum of technical terms and with particular emphasis on the pioneer uses of trees and their peculiar value to the woodcrafter.

Forest tree seed of the North Temperate regions, with special reference to North America, H. I. BALDWIN (*Waltham, Mass.: Chron. Bot. Co., 1942, pp. XVI+240, figs. 28*).—This text, which is essentially a progress report on the status of investigative work with seeds, deals with the structure and development of seeds, their production by trees, the effect of seed origin on growth, seed collection and extraction, storage, control of biotic enemies, factors affecting germination, the chemistry of seeds, etc.

Douglas fir seed from young trees, G. S. ALLEN (*Jour. Forestry, 40 (1942), No. 9, pp. 722-723*).—Evidence was obtained that young trees are capable of producing normal, viable seeds and factors other than age are important. One requirement would appear to be adequate cross-pollination, which is often lacking in young stands which produce little pollen. A cutting test of seed from sample cones is essential to determine the percentage of filled seeds. At least 60 percent of the seeds should be filled before a stand of trees may be considered a suitable source of seed.

Stratification as a means of improving results of direct seeding of pines, T. F. McLINTOCK. (U. S. D. A.). (*Jour. Forestry, 40 (1942), No. 9, pp. 724-728*).—Stratification improved both the germination and catch of directly seeded Virginia, shortleaf, and pitch pines but reduced the catch of loblolly pine. The best results were obtained with Virginia pine. The effects of stratification were much more pronounced on north than on south slopes. The results indicated that, for Virginia, shortleaf, and pitch pines grown in the Central States, stratification removes much of the hazard from direct seeding as a method of reforestation and makes such seeding feasible and practical on favorable sites.

Yield of even-aged stands of loblolly pine in northern Louisiana, W. H. MEYER (*Yale Univ. School Forestry Bul. 51 (1942), pp. [4]+39, figs. 13*).—Measurements taken over a period of years on 273 sample plats in comparatively fully stocked even-aged loblolly pine forests in northern Louisiana and southern Arkansas are utilized as a basis for various tables and charts, such as yield tables, stand and stock tables, etc.

Height of red pine saplings as associated with density, H. L. SHIRLEY and P. ZEHNGRAFF (U. S. D. A.). (*Ecology, 23 (1942), No. 3, p. 370*).—Trees growing in relatively dense stands made greater height growth than did scattered trees of the same age. Whether the increase in height resulted from the greater density of the stand or from some more favorable soil factors in the thicket is unanswered.

Effects of the 1940 Armistice Day freeze on Siberian elm in the Plains country, H. E. ENGSTROM and L. S. MATTHEW. (U. S. D. A.). (*Jour. Forestry, 40 (1942), No. 9, pp. 704-708*).—This article, with supplemental comments by C. G. Bates, points out that native species survived the freeze without serious

damage, while many introduced species suffered severely. Exotics, such as Siberian elm, should be included in the plantings only to the extent necessitated by temporary benefits. There was evidence of strain differences in the Siberian elm and that this species is best adapted to dry-land and protected sites.

The Central American species of *Quercus*, C. H. MULLER (U. S. Dept. Agr., Misc. Pub. 477 (1942), pp. III+216, pls. 124).—Botanical descriptions are presented for a large number of species, supported by information on subgeneric and species concepts, morphological basis of classification, etc.

Forest site determination by soil and erosion classification, W. E. COOPER. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 9, pp. 709-712).—Apparently various factors, such as topographic features, profile characteristics, soil acidity, chemical relationships, and forest litter, have an important bearing on forest growth. No one but rather all of these factors should be taken into consideration, and any method which centers on any one factor to the exclusion of the others would not be entirely accurate. Classification of sites by soil series and by the intensity of erosion appears to be broad enough to include most of the factors mentioned and is simple enough to provide the necessary means for recording differences in fertility.

Natural restocking of redwood cutover lands, H. L. PERSON and W. HALLIN. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 40 (1942), No. 9, pp. 683-688, figs. 2).—Much of the redwood land cut-over in Mendocino and Humboldt Counties, Calif., between 1920 and 1935 was found to be seriously understocked. Sprouts provided less than 10 percent of full stocking, leaving the main reliance upon seedlings. Satisfactory regeneration did not occur on severely burned high-lead and slack-line settings, where an average of only one good seed tree to each 5 acres was found over large areas. The minimum trees needed to provide fairly good stocking ranged from 4 per acre on favorable north slopes to 8 or more for south exposures. The importance of full removal of litter and slash in providing adequate regeneration was indicated. Redwood being more shade-tolerant than its principal associates, white fir and Douglas fir, was better able to reestablish itself in selectively logged areas. Partial shade, exposed mineral soil, and a good seed supply assured adequate natural regeneration on good redwood sites.

Dendrochronology in pines of Arkansas, E. SCHULMAN. (Univ. Ariz.). (*Ecology*, 23 (1942), No. 3, pp. 309-318, figs. 7).—Late wood, early wood, and total ring chronologies 160 yr. in length are presented for shortleaf pine growing on a well-drained site in the Ouachita Mountains, Ark. Crossdating between trees was found strongest in the late wood and to hold for the maxima nearly as well as the minima. The relationship of late wood growth to precipitation of July-September for 83 yr. of record was found to be moderately close; little relation existed between early wood and precipitation, except for the extreme years; and there was little evidence for any carry-over effect from year to year of precipitation, although some small influence of spring precipitation on late wood growth was occasionally evident. Late wood growth was shown to be to some extent inversely proportional to the mean temperatures of July through September.

Collect the bounty on your wolf-trees, G. R. CONDIT, M. A. HUBERMAN, and J. R. MCGUIRE. (U. S. D. A. et al.). (*Jour. Forestry*, 40 (1942), No. 9, pp. 680-682, fig. 1).—White pine wolf trees, those with huge side branches and very little potentially valuable lumber, are undesirable because of the space they occupy and their harmful effect on underlying reproduction. With a strong demand for boxboards and for fuelwood, it is conceded a good time to cut such trees and, if the work is done by the owner, a fair profit may be realized. With

care, sufficient reproduction may be conserved beneath the trees to regenerate the stand.

Variations in fire-danger factors on a ranger district in the longleaf pine region, P. KNOX. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 9, pp. 689-692).—A comparison of variations in danger factors on several sites located in an area of some 384,000 acres in Alabama showed no significant difference among stations with respect to the moisture percentage of basswood indicators. Very significant differences were recorded among the stations as to wind velocity and rate-of-spread index. The desirability of running a series of checks of anemometer readings on tentative sites before establishing a permanent fire-danger rating station, even on relatively level longleaf pine lands, is suggested.

Measuring the efficiency of fire control in California chaparral, D. H. ROGERS. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 40 (1942), No. 9, pp. 697-703).—The following correlations were established between age of chaparral cover and size of fire under a given standard of fire protection: Fires of 0 to 0.24 acre will occur in covers of any age; fires of 0.25 to 9.99 acres require at least a 3-year-old cover; fires of 10 to 39.99 acres require at least a 7-year-old cover; and fires of 40 acres or more require at least a 13-year-old cover. As the age of the cover increases above the minimum ages required for each size class, individual fires tend to become larger.

Transect method of estimating forest area from aerial photograph index sheets, P. R. KRAMER and E. E. STURGEON. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 9, pp. 693-696).—A method of transecting is described which may be used for estimating the extent of various land-use areas from aerial photograph index sheets. Linear measurements are made along uniformly spaced transect lines, superimposed on the photographs by use of a celluloid guide. The measurements are then totaled and converted to figures for ground area.

DISEASES OF PLANTS

The nature and prevention of plant diseases, K. S. CHESTER (*Philadelphia: Blakiston Co.*, [1942], pp. XII+584, [pl. 1], figs. 207).—"The subject matter of this book and the manner of treatment have been largely dictated by the needs of students to whom an elementary course in plant pathology is a part of the background fitting them for useful work in agriculture. . . . The book has the dual purpose of introducing the student to the essential features of the science, as exemplified in important diseases of our leading crops, and of providing him with a work to which he may refer for detailed and specific directions on plant disease control."

Diseases of major importance to agriculture in the southern United States are given special attention.

The Plant Disease Reporter, [October 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 26 (1942), Nos. 18, pp. 389-405, figs. 4; 19, pp. 407-420, figs. 2).—In addition to the host-parasite check-list revision, by F. Weiss (Nos. 18, *Spartium* to *Syringa*, and 19, *Tabebuia* to *Thespesia*), the following are included:

No. 18.—*Heterodera rostochiensis*, the golden nematode of potatoes, in New York State, by B. G. Chtwood, R. L. Clement, R. Morgan, and R. Tank; recently active leaf diseases of woody plants in Idaho, by J. Ehrlich; barley scab and blight present in local areas in the 1942 crop, by J. G. Dickson; and brief notes on potato late blight—first report for Nebraska, a new introduction of tobacco black shank into Kentucky, small grain diseases in South Dakota, and spotting of cherry fruits caused by the leaf spot fungus.

No. 19.—Ergot epiphytotic in southwestern pastures, by K. S. Chester and C. L. Lefebvre; the meadow nematode (*Pratylenchus pratensis*) on tobacco in South Carolina, by T. W. Graham; current notes on plant diseases in Massachusetts, by O. C. Boyd; reports on *Helminthosporium* leaf blight of corn in New York, corn diseases in Maryland, and *Helminthosporium* leaf spot and bacterial wilt on field corn in Indiana; and brief notes on *Peronospora* on soybean in Virginia, and carnation bacterial wilt in Indiana.

Plant diseases: Their nature, cause, and control. (Coop. U. S. D. A. et al.). (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, pp. 4, 5).—Brief summaries and progress reports are presented by C. Dorman relative to control work by the station on wilts, nematodes, and seedling diseases of cotton; disinfection of sweetpotato roots; wilt-resistant strains of watermelons; early blight prevention and wilt resistance in tomatoes; and control of cabbage downy mildew and wire stem.

[Work on plant diseases by the New York State Station] (*New York State Sta. Rpt.* 1942, pp. 52-58, 59-60, 76-78).—Reports of progress are included on averting spray injury in the apple scab control program in western New York; apple scab and its control in the Hudson Valley; epidemiology and control of rust diseases of the apple in the Hudson Valley, and of cherry leaf spot; cause and control of peach cankers; summer spray program for peaches; diseases of grapes, raspberries, currants, and gooseberries and their control; a survey of canning crop diseases; effect of seed treatment on the growth of pea plants, and of pea seed protectants on nodule bacteria; effect of environal conditions on seed decay, damping-off, and root rot of canning crops; lima bean seed treatment; diseases of canning tomatoes and their control; production of disease-free bean seed with special reference to mosaic; yellows-resistant cabbages; spraying for control of downy and powdery mildews, leafhoppers, and sooty mold on hops; seed treatment and spraying and dusting of lima beans; breeding cauliflower for resistance to black rot; seed-borne micro-organisms of spinach, peas, and corn; and seed treatment tests in the laboratory and field, including several of the newer fungicides such as Spergon, 1205FF, U.S.R. No. 604, 154-6B, and DuBay 1228E.

Recent phytopathological events in South Dakota, W. F. BUCHHOLTZ. (*S. Dak. Expt. Sta.*). (*S. Dak. State Hort. Soc., Ann. Rpt.*, 39 (1942), pp. 43-46).—The author refers to the increased emphasis on phytopathological research in the State and to recent outstanding cases of plant diseases and their control, including an extreme epidemic of fire blight on apple in a northern Black Hills area, serious damage by *Fusarium* wilt in a watermelon-growing district, and stand failures in grass reseeding due to soil-borne seedling and root parasites.

Organization for plant pathology in England and Wales—retrospect and prospect, W. C. MOORE (*Brit. Mycol. Soc. Trans.*, 25 (1942), pt. 3, pp. 229-245).—This address refers particularly to the applied aspects of plant pathology, including diseases due to fungi, bacteria, viruses, and nonparasitic causes, as well as to insects and other plant pests.

List of diseases of economic plants recorded in Scotland, R. W. G. DENNIS and C. E. FOISTER (*Brit. Mycol. Soc. Trans.*, 25 (1942), pt. 3, pp. 266-306, fig. 1).—An annotated list, with introductory discussion.

Elimination of contaminants with ultra-violet radiation, A. M. KLIGMAN (*Science*, 96 (1942), No. 2481, pp. 69-70).—Irradiation of a small inoculating room, containing several tables, for 4 hr. with a Westinghouse Sterilamp rendered the originally contaminated atmosphere practically sterile.

Breeding disease-resistant crops, F. N. BIGGS. (Univ. Calif.). (*Science*, 96 (1942), No. 2481, p. 60).—Referring to a recent paper by Stevens (E. S. R.,

87, p. 527), attention is called to the method of backcrossing for avoidance of the danger of introducing genes for susceptibility to one or more diseases when breeding for resistance to another.

On the generic name of the gram-positive bacterial plant pathogens, W. J. DOWSON (*Brit. Mycol. Soc. Trans.*, 25 (1942), pt. 3, pp. 311-314).—It is recommended that these six bacterial species, listed in the Bergey Manual of Determinative Bacteriology (E. S. R., 81, p. 489) under *Phytomonas*, be referred to the genus *Corynebacterium*. There are 20 references.

The genus *Peronospora* in the Punjab, KARTAR SINGH THIND (*Jour. Indian Bot. Soc.*, 21 (1942), No. 3-4, pp. 197-215, pl. 1, figs. 16).—The author describes 16 species of *Peronospora* on 20 hosts, 6 of the fungi being new records for India and 7 of the plants new host records.

Puccinia phyllocladiae Cooke, a new record for India, KARTAR SINGH THIND (*Jour. Indian Bot. Soc.*, 21 (1942), No. 3-4, pp. 195-196, fig. 1).—This rust is reported on *Asparagus gracilis*.

A technique for the anatomical study of root parasitism, L. S. S. KUMAR, A. ABRAHAM, and S. SOLOMON (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 21, pp. 177-182, pl. 1).—The new technic described involves fixation in Nawaschin's fluid, clearing in 1 percent KOH solution, and staining by a modified Feulgen technic. The advantages of the method are indicated.

El agotamiento del humus en el terreno y su influencia sobre ciertas clases de podredumbres de la raíz, que aparentemente son de origen patógeno y que realmente no son más que casos de inanición y muerte por hambre deb ido a una alimentación deficiente de la planta [Exhaustion of humus in the soil and its influence on certain classes of root rots which appear to be of pathogenic origin but which actually are cases of starvation and death due to nutritional deficiencies], J. A. ALVARADO (*Café El Salvador*, 12 (1942), Nos. 135, pp. 170-192, figs. 11; 136, pp. 242-252, figs. 5; 137, pp. 282-301, figs. 8; 138, pp. 346-362, figs. 8; 139, pp. 396-409, figs. 5; 141, pp. 523-534, figs. 2).

A cancerous neoplasm of plants: Autonomous bacteria-free crown-gall tissue, P. R. WHITE and A. C. BRAUN (*Cancer Res.*, 2 (1942), No. 9, pp. 597-617, figs. 13).—"Secondary or metastatic tumors frequently arise on sunflower plants inoculated with *Phytomonas tumefaciens* at considerable distances from the primary tumefactions. These have been shown by cultural and serological methods to be characteristically bacteria-free. Tissue cultures isolated from these tumors show a rapid disorganized type of growth contrasting sharply with the slow, moderately organized growth of those isolated from healthy tissues. Upon implantation into uninfected plants of the same or related species, these tissues produce typical crown-gall tumors. This capacity for unrestrained, invasive, potentially malignant growth both in vivo and in vitro in the absence of the original excitant differentiates these tissues from any other plant materials reported to date and places them in a category comparable to cancerous growths in animals." It is believed that these findings may well render great service in the study of the origin and character of those changes in cell behavior which are considered to be the basis of "the cancer problem."

Crystallography and plant viruses, F. C. BAWDEN (*Nature [London]*, 149 (1942), No. 3777, pp. 321-322).—This is a brief review of recent technics and results in virus studies which have opened up a field of research that promises to be extremely fertile. It is seen that it is their internal regularity, lack of water, and chemical simplicity which separate the viruses most sharply from the simplest recognized organisms. With extension of X-ray analysis to spacings as great as 1,000 a. u. and improvements in the electron microscope, particles

of all sizes from bacteria to atoms become capable of direct examination, and a serious gap in the technics for studying colloidal particles has been filled.

Virus nomenclature and classification, W. D. VALLEAU. (Ky. Expt. Sta.). (*Chron. Bot.*, 7 (1942), No. 4, pp. 152-154).—This is a general review and discussion of recent contributions to the subject, with the author's suggestion that as rapidly as viruses affecting certain plant groups have been sufficiently studied to demonstrate their relationships to one another and to some of the well-known viruses, they be assigned binomials which would either place them with recognized genera, or, if evidence warranted, in newly established genera.

Presence of virus in the primordial meristem, F. M. L. SHEFFIELD (*Ann. Appl. Biol.*, 29 (1942), No. 1, pp. 16-17).—It was at first thought that the absence of intracellular inclusions from the apical meristem of infected plants might be due to failure of the virus to penetrate there. However, when this tissue was dissected out from shoots or roots of plants with tobacco or aucuba mosaics, infections were obtained from it.

Results of experiments with chlorotic streak in 1941, E. V. ABBOTT. (U. S. D. A.). (*Sugar Bul.*, 20 (1942), No. 18, pp. 161-165).—This is a progress report on continued field experiments (E. S. R., 86, p. 795), with this sugarcane virus, summarizing data on the effects of the disease on yields, varietal resistance tests, and control by roguing and hot water treatment.

Studies on the mechanism of fungicidal action, II, III, A. F. PARKER-RHODES (*Ann. Appl. Biol.*, 29 (1942), No. 2, pp. 126-143, figs. 2).—Continuing this series (E. S. R., 87, p. 380), two papers are presented:

II. *Elements of the theory of variability* (pp. 126-135).—Variability is defined and methods of estimation are outlined. It is shown that variability of a given population of spores to a compound which can penetrate their walls is less than to any other compound of the same element which cannot do so unless it undergoes one or more reactions on the spore surface with substances secreted by it, and the greater the number of such successive reactions required to bring it to a permeable form, the greater will the variability be. Instability in a compound increases the apparent value of the variability of the spores to it. Their variability to any compound is proportional to the square of the number of atoms of the effective element in a molecule of that compound; and the index of variation is inversely proportional to that number, provided only one compound is permeative. If a molecule undergoes a very small dissociation into parts, some of which contain none of the active element but which are permeative whereas the undissociated molecule is not, then the variability to such a compound is proportional to the square of the number of parts into which it dissociates, and the index of variation inversely proportional to that number. Most kinds of synergism occurring between constituents of a mixture used in a test or between a compound under test and any product formed therefrom in the course of its toxic action will interfere with the results by increasing the apparent value of the variability. The application of these laws to analysis of experimental results is discussed.

III. *Sulphur* (pp. 136-143).—The reactions of spores of *Macrosporium sarcinaeforme* to a selection of S compounds (including elementary S) were studied, and details are given of the methods used with H_2S , involving examination of the behavior of the spores in a static atmosphere containing the gas. It is inferred from the results that S can be absorbed by the spores only in the form of the ions hydrosulfide, dithionite, or pyrosulfite, or else only as thiosulfite, and of the yellow and white isomers of the ions it is thought possible that only the latter can be absorbed. It is believed probable that in the given case S exerts

its effect indirectly through the pyrosulfoxyolate ion in the hydrolysate. Agreement of the results with the theory of variability is noted.

There are 18 references to the two parts.

Substitutes for copper and zinc in fungicidal sprays, J. W. ROBERTS. (U. S. D. A.). (*Indus. and Engin. Chem.*, 34 (1942), No. 4, pp. 497-498, fig. 1).—A preliminary report.

"Fermate"—new Du Pont fungicide, D. H. PALMITER and J. M. HAMILTON (N. Y. State Expt. Sta. et al.). (*Agr. News Letter*, 10 (1942), No. 3, pp. 57-58).—A note on the new fungicide Fermate (ferric dimethyl dithiocarbamate). Good control with this material is reported for apple scab, cedar-apple rust, and brown rot on sweet cherries.

Derivatives of dithiocarbamic acid as pesticides, W. H. TISDALE and A. L. FLENNER (*Indus. and Engin. Chem.*, 34 (1942), No. 4, pp. 501-502).—Data on fungicidal efficiency include tests against barley covered smut, *Fomes annosus*, *Aspergillus niger*, fungus infections of the skin, *Botrytis tulipae*, *Venturia inaequalis*, rose mildew, and *Coccomyces hiemalis*. Tests against insects, mites, and other skin infections, and cecal coccidiosis of poultry are also reported.

USGA reports on substitutes for mercury fungicides, J. MONTEITH, JR. (*Golfdom*, 16 (1942), No. 5, pp. 28, 30, fig. 1).—In tests of over 100 chemicals, tetramethylthiuram disulfide proved of real value for controlling snow mold, brown patch, dollar spot, and other diseases of turf.

"Thiosan"—A new turf fungicide, C. HORN (*Golfdom*, 16 (1942), No. 5, pp. 13-14, figs. 2).—The effectiveness of this new fungicide (tetramethylthiuram disulfide), containing neither Hg nor any other metallic element, is said to have been demonstrated by tests on 18 playing greens in Delaware and New Jersey.

Pythium root rot of grasses, T. C. VANTERPOOL (*Sci. Agr.*, 22 (1942), No. 11, pp. 674-687, figs. 8).—Grown in the greenhouse in *Pythium*-infested soil from areas in wheat fields severely diseased with browning root rot, the common commercial grasses also became heavily attacked. The same pathogenic species, viz, *P. aristosporum*, *P. arrhenomanes*, *P. graminicola*, *P. tardicrescens*, and *P. volutum* are of major concern on both grasses and cereals, with *P. debaryanum* and its close allies less so. Under the same conditions, legume and flax roots were not attacked by the forms severely pathogenic on graminaceous hosts, but forms of the *P. debaryanum* group were isolated though the roots commonly showed little in the way of lesions. Field damage to grasses appears to be greatest in the early growth stages, suggesting the use of high-grade seed as an initial step in control. Further injury may occur in later growth periods when new roots are emerging from the crown. In the infested field soils used, phosphate-containing fertilizers, especially with ammonium phosphate, increased the growth of grasses considerably in pot tests when applied at seeding time. Applied alone, this phosphate usually had no effect or was slightly detrimental. The effects of various fertilizers in normal field soil during the establishment phase are also given. It is tentatively suggested that if grasses are to be grown in severely infested wheat fields which have given economical increases from phosphatic fertilizer amendments, at least trial strip applications of ammonium phosphate should be made. It is believed that more vigorous seedlings and a better stand will be thus secured, especially if the seeding is done on fallowed land, and an increase in the quality or nutritive value of the forage will result. There are 27 references.

Viability of dusted wheat after storage, G. T. S. BAYLIS (*New Zeal. Jour. Sci. and Technol.*, 23 (1941), No. 3A, pp. 126A-130A).—Both Agrosan G and Ceresan U. T. 1875A improved the field germination of Solid Straw Tuscan wheat after storage for 12 mo. Wheat samples of 16.7-12.8 percent moisture content

were included, and dusts were used at both standard and excess dosages. Injury from dusting occurred when wheat with 16.7 percent moisture was stored for 12 mo. in a closely lidded bin, but under such conditions field germination of nondusted wheat also declined substantially. Data are included relating to changes in moisture content of wheat during storage and to the relationship between field and laboratory germination tests of dusted grain.

Heat inactivation of wheat mosaic virus in soils, F. JOHNSON. (Ohio State Univ.). (*Science*, 95 (1942), No. 2476, p. 610).—This virus was inactivated in the soil when exposed to 50°–60° C. for 10 min.

Third revision of the International Register of Physiologic Races of the Leaf Rust of Wheat (*Puccinia rubigo-vera tritici* (tritricina)), C. O. JOHNSTON, H. B. HUMPHREY, R. M. CALDWELL, and L. E. COMPTON. (Coop. Kans. and Ind. Expt. Stas.). (*U. S. Dept. Agr., Bur. Plant Indus.*, 1942, pp. [1]+20).—This revision (E. S. R., 81, p. 226) brings available information up to January 1942. Included are an analytical key for identifying the physiological races determined on the basis of their parasitic behavior on wheat varieties and a table showing the reactions of differential wheat varieties to these races.

Raças fisiológicas da *Puccinia graminis tritici* em Portugal [Physiologic races of *P. graminis tritici* in Portugal], B. D'OLIVEIRA and M. C. FILIPE DE SOUSA (*Agron. Lusitana*, 2 (1940), No. 3, pp. 243–252; *Eng. abs.*, p. 252).—Six physiologic races were found, viz, 14, 15, 24, 27, 40, and a new one described as 187. The reactions of the collection of Portuguese wheats to races 24, 27, and 40 are presented.

Stem eelworm disease of french beans: First record in New South Wales, R. D. WILSON (*Agr. Gaz. N. S. Wales*, 53 (1942), No. 2, pp. 95–99, figs. 5).—Infestation of French bean plants by *Anguillulina dipsaci* is reported, and a general discussion of this nematode and its control is given.

Internal breakdown of table beets, O. A. LORENZ ([*New York*] *Cornell Sta. Mem.* 246 (1942), pp. 42, pls. 7, figs. 5).—The experimental results here reported indicate that soil moisture has much to do with the availability to beet plants of boron applied to the soil. For example, with low soil moisture content, soil applications of borax at 300 lb. per acre injured table-beet plants very little, but with high soil moisture 100 lb. was toxic. The effect of low soil moisture in retarding the absorption of B was probably only temporary, since B again became available with increased moisture content. Plant growth was increased above that in solutions containing 0.01 p. p. m. B and 10 p. p. m. Ca either by increasing the B concentration without increasing that of Ca or by increasing the concentration of Ca without increasing that of B. When B increments at any Ca level were associated with increased growth, they were also associated with increased Ca absorption. However, it was indicated that growth could not have depended on Ca absorption in itself, probably depending rather on Ca utilization. The interaction between B and K was in the opposite direction from that between B and Ca. That is, B increments were more efficient in increasing growth at the higher than at the lower levels of K, whereas in the B–Ca experiments increments of B caused the greatest increase in growth at the lowest Ca levels. Absorption of K depended chiefly on its concentration in the nutrient solution. These results support the view that B aids the plant in absorbing cations, but B seems more closely associated with utilization than with absorption of Ca and K.

There were no consistent differences in dry weight as percentage of fresh weight between normal and break-down tissues. On the dry weight basis, ash, Ca, Mg, P, and Fe accumulated in considerable amounts in the areas of break-down tissue; K less so. Total and protein N were higher in affected

tissue, but there was little difference in soluble N. Total sugars, sucrose, and alcohol-soluble solids were higher in normal tissue, whereas reducing sugars and starch were higher in the break-down tissue. Microchemical studies showed B deficiency to be associated with reduction of pectic-staining materials in the intercellular spaces, and later a reduction in cellulosic-staining materials. B-deficient tissues of the roots had a lower protopectin:pectin ratio than normal tissues of the same beet. It is suggested that the effect of B deficiency may be to prevent the formation of certain compounds such as protopectins rather than to destroy compounds already formed. Possibly B acts as a catalyzer in forming protopectic substance such as calcium pectate. Anatomical symptoms of B deficiency were usually first noted in the parenchymatous tissues and vessels in the petioles of younger leaves.

Cotton root rot studies with special reference to sclerotia, cover crops, rotations, tillage, seeding rates, soil fungicides, and effects on seed quality, C. H. ROGERS (*Texas Sta. Bul. 614* (1942), pp. 45, figs. 10).—Sclerotia of *Phymatotrichum omnivorum* were recovered to a depth of 8 ft. in the Blackland soils and in quantities of several million per acre in the first 3-4 ft. Reductions in sclerotial numbers after crop rotations and green manuring were scarcely large enough to account for partial control of root rot obtained, suggesting that the beneficial effect might have been on the active stage of the fungus in the soil or directly on the cotton plant. Microscopical studies indicated some structural difference between viable and nonviable sclerotia. In the usual cotton-corn-oats rotation with oats followed by summer catch crops of cowpeas and sorghum plowed under in late summer, the yield of lint cotton in 1941 was greater by 100 lb. per acre in the plats receiving this treatment than in continuous cotton plats and the amount of root rot was 20-30 percent less. Similarly, the yield from cotton following plowed-under Hubam stubble was twice as large as that from continuous cotton plats and root rot was reduced from 70 to 15-20 percent. Early plowing under of cotton plants in 1940 resulted in a yield increase of 120 lb. of seed cotton per acre in 1941 as compared with the usual late turning of the stalks.

Sesbania, guar, and certain selections of Brabham and Iron cowpeas were resistant and may prove valuable in rotations designed for root rot control and soil improvement. In a 3-yr. study, cotton was planted at rates of 2, 5, and 10 seeds per hill, in hills 18 in. apart and the stand thinned to not more than 2 plants per hill in all plats at time of chopping. The plats planted with the fewest seeds per hill had the least root rot at the end of the season. Subsoiling or tillage to 15 in. or more reduced the amount of root rot, but no outstanding yield increase was obtained. Soil treatment with certain fungicides (e. g., crude oil) was effective if applied sufficiently deep. Seed from plants killed early in the season by root rot had lower oil and protein contents and lower viability than that from plants escaping root rot during seed development. There are 26 references.

Cotton seed disinfection in war-time, A. S. BOUGHEY (*Nature* [London], 149 (1942), No. 3767, pp. 50-51).—As a substitute for seed treatment with mercurials, it was found that holding cottonseed for 48 hr. in four times its weight of irrigation water eliminated practically all traces of *Bacterium* (= *Phytophthora*) *malvacearum*. From laboratory studies it appeared that this effect was due to exposure of the pathogen to anaerobic conditions resulting from bacterial activity and O₂ absorption by the germinating seed.

El tratamiento de la semilla de algodón con productos anticriptogámicos [Cottonseed treatment with fungicides], M. A. DI FONZO (*Argentina Min. Agr., Junta Nac. Algodón, Bol. Mens. No. 81-82* (1942), pp. 43-51, figs. 10).—

The effectiveness of various fungicides against seed-borne diseases of cotton was compared by seed treatment tests in the laboratory and field.

Flax rust, W. P. CASS SMITH (*Jour. Dept. Agr. West. Austral.*, 2. ser., 19 (1942), No. 1, pp. 56-63, figs. 4).—Though flax varieties for oil and for linseed have been grown in Western Australia for about 30 yr., large-scale commercial production has only been attempted during the current war. With the increase in culture, rust has made its appearance in epidemic form in at least one section. This paper reviews the local situation and summarizes data on the disease and its control.

Stem-break and browning (*Polyspora lini*) of flax in New Zealand, G. T. S. BAYLIS (*New Zeal. Jour. Sci. and Technol.*, 23 (1941), No. 1A, pp. 1A-8A, figs. 4).—The symptoms of this disease from two local areas are described. Among 19 flax varieties tested, 3 proved resistant and 1 almost immune. Seed-borne infection was eliminated by a 10-min. treatment of the seed in water at 126° F., and swelling of the mucilaginous seed coat during the process was avoided by freely dusting the seed with hydrated lime and adding 1 percent to the water.

Seed treatment as an aid in the wartime production of peanuts, H. C. BUCHA (*Agr. News Letter*, 10 (1942), No. 5, pp. 114-122).—Poor stands of peanuts, one of the chief obstacles to high yields, are usually due to seed decay in the soil. After reviewing data on seed treatment tests by others, the author presents the detailed results of greenhouse and field experiments with the sulfur compound 50 percent tetramethyl thiuram disulfide ("DuBay" 1205-FF) in which it compared very favorably with the organic mercurial Ceresan in preventing seed decay and materially increasing emergence. It appears that adoption of peanut seed treatment would provide a simple and inexpensive means of increasing farm income and at the same time aid in meeting the greatly heightened demand for peanut oil during the war.

Dois virus no pimenteiro [Two virus diseases of pepper], M. DE LOURDES D'OLIVEIRA (*Agron. Lusitana*, 2 (1940), No. 3, pp. 209-223; *Eng. abs.*, pp. 221-222).—The viruses isolated from *Capsicum annum* in two different parts of Portugal were those of tobacco mosaic and cucumber mosaic, identified by experimental inoculations and study of some of their physical and chemical properties. The symptoms, transmission, and control are discussed. There are 15 references.

Nematode infection in Poa, W. G. DORE (*Rhodora*, 44 (1942), No. 523, pp. 246-247, figs. 3).—Note on nematode infestation of *P. pratensis* in Nova Scotia.

Trace-elements and "potato-sickness," C. ELLENBY (*Nature [London]*, 149 (1942) No. 3767, p. 50, fig. 1).—Results of the preliminary studies outlined lend support to the view that *Heterodera schachtii* is not the sole cause of the disease known as potato sickness. Planted on badly infested land, potatoes supplied with certain trace elements, particularly Zn, B, and Mn, far surpassed in growth and weight of crop those not so treated.

Ring rot in volunteer plants, R. BONDE. (Maine Expt. Sta.). (*Amer. Potato Jour.*, 19 (1942), No. 7, pp. 131-133).—In several years' field tests (1934-40) the ring rot bacteria failed to remain viable through the winter in the soil of certain fields that had produced badly diseased crops, but the disease was perpetuated in the field in infected tubers which survived the winter and produced volunteer plants. Such diseased plants may contaminate any disease-free stock that may be planted in the same soil.

Plant nutrition and the hydrogen ion.—II, Potato scab, R. A. SCHROEDER and W. A. ALBRECHT. (Mo. Expt. Sta.). (*Amer. Soc. Agron., Com. Fert. Min.*,

7 (1941), pp. 18-23).—Continuing this series (E. S. R., 87, p. 186), the authors found, in the light of the experimental data presented, that they were "forced to take the potato scab problem largely out of the category of pathology with the degree of soil acidity in control and to put it mainly into the category of plant nutrition with soil fertility at the controls. When the increased mobilization of plant nutrients, more particularly certain cations, in the presence of the hydrogen ion in contrast to lowered mobilization in hydrogen absence is appreciated, we shall be solving more rapidly some of the problems of so-called plant disease, of lowered crop yield, and of reduced crop quality. We shall arrive at these solutions not only by providing the supply of a well balanced soil fertility, but also by appreciating the presence of the hydrogen ion, by discontinuing to regard soil fertility mainly as single nutrient concepts, and by discontinuing to fight hydrogen presence in the soil by excessive carbonate applications. Only through the fuller understanding of the numerous interrelations between both the complex soil behaviors and the plant behaviors can crop production of the highest order in economic and nutritional aspects be attained."

The main virus diseases of the potato in Victoria, J. G. BALD and A. T. PUGSLEY (*Austral. Council Sci. and Indus. Res. Pam.* 110 (1941), pp. 40, pls. 4).—The authors summarize experiments and observations over a 5-yr. period on the virus diseases of Victorian potato varieties, including some properties and reactions of a number of the viruses and the distribution and incidence of these diseases in Victoria. There are 23 references.

The effect of potato virus X on growth and yield, J. G. BALD (*Austral. Jour. Sci.*, 4 (1942), No. 6, pp. 177-178).—If tobacco mosaic and similar viruses partly replace normal reserves of chromoprotein, the comparatively small effect they often have on host plant growth would become understandable. In infection tests with virus X in potato and *Datura stramonium* the results briefly described are said to be such as would naturally follow if virus multiplication were a partial substitute for the synthesis of chromoprotein or chlorophyll protein and if these proteins were stored up beyond the minimum requirements for photosynthesis as inert reserve material.

Preserving plant viruses in vitro by means of a simplified lyophile apparatus, T. P. DYKSTRA and H. G. DU BUY. (U. S. D. A. and Univ. Md.). (*Science*, 96 (1942), No. 2486, pp. 189-190, fig. 1).—The Y-virus and Canada streak virus of potato, extracted in CO₂ with the procedure and apparatus described, continued to produce 100 percent infection as long as 4 mo. after extraction and dehydration.

Transmission of potato virus Y by *Aphis rhamni* (Boyer), B. KASSANIS (*Ann. Appl. Biol.*, 29 (1942), No. 1, p. 95).

Investigations on potato root eelworm, *Heterodera rostochiensis* Wollenweber on the cyst population of a field over a series of years, H. W. and M. MILES (*Ann. Appl. Biol.*, 29 (1942), No. 2, pp. 109-114).—In the absence of the host there was a gradual decrease in the viability of the cysts, but the 7-yr. period between the potato crops of 1928 and 1936 proved insufficient to kill all cysts. Two crops of potatoes with a 3-yr. interval were enough to restore the cyst population to the previous level. The 7-yr. interval between crops was associated with the disappearance of all signs of "potato sickness" in the two subsequent crops.

Sorghum diseases and their control, J. O. MILLER (*Kans. State Col. Bot. M. Ctr.* 41 (1942), pp. 8, figs. 8).

Disease testing and initial seedling selection work at the Houma Station during 1940 and 1941, E. V. ABBOTT and E. M. SUMMERS. (U. S. D. A.). (*Sugar Bul.*, 20 (1942), No. 18, pp. 137-141).—This is a continuation of previous progress reports (E. S. R., 83, p. 505) on disease-testing and initial sugarcane

seedling selection work by pathologists at the U. S. Sugar Plant Field Station, Houma, La., including disease reactions of unreleased varieties at the test fields, recent test field introductions, total seedlings tested and new C. P. numbers assigned, seedling progeny tests, and Turkestan hybrid seedlings. With regard to the last, as the hybrids approach commercial type in the nobilization process the proportion of mosaic-resistant individuals is being materially increased.

The hot water treatment of cane seed, W. J. LUKE and C. W. EDGERTON (*Sugar Bul.*, 20 (1942), No. 18, p. 148).—Preliminary tests indicate the probability that sugarcane yields with certain varieties can be increased by treating the seed cane with hot water. On the basis of large-scale field tests and a number of small tests it was recommended that where equipment was available seed cane of the varieties C. P. 29-320 and C. P. 28-19 be treated for the September and October plantings, but insufficient information was available for definite recommendations as to other varieties.

Alternaria on leaves of sunflower in India, A. B. BOSE (*Jour. Indian Bot. Soc.*, 21 (1942), No. 3-4, pp. 179-184, figs. 2).—*A. tenuis*, causing a leaf spot of sunflower, is reported for the first time from India.

Association of tobacco leafspot bacteria with roots of crop plants, W. D. VALLEAU, E. M. JOHNSON, and S. DIAOHUN. (Ky. Expt. Sta.). (*Science*, 96 (1942), No. 2485, p. 164).—From experiments briefly reported, it appears that the causal bacteria of tobacco wildfire and angular leaf spot can maintain themselves on the roots of several unrelated crop plants for at least 6 mo. and can under certain natural conditions cause specific leaf spot diseases of several unrelated plants such as tobacco, tomato, morning-glory, and cowpea. These bacteria are believed to be common (but specific) organisms present on the roots, perhaps of native vegetation, which can and do, under special favorable circumstances, cause specific leaf spots of tobacco.

Phytopathological classics, No. 7 (*Phytopathol. Classics No. 7* (1942), pp. 62, pls. 7).—This issue includes the following articles, with translations from the original German and preface and biographical sketches by J. Johnson: Concerning the Mosaic Disease of Tobacco, by A. Mayer; Concerning the Mosaic Disease of the Tobacco Plant, by D. Ivanowski; Concerning a Contagium Vivum Fluidum as Cause of the Spot Disease of Tobacco Leaves, by M. W. Beijerinck; and On the Etiology of Infectious Variegation, by E. Baur.

Effect of infecting carrot plants with certain viruses on seedstalk development, E. SAYED SAKR and H. C. THOMPSON. (Cornell Univ.). (*Plant Physiol.*, 17 (1942), No. 3, pp. 500-502, fig. 1).—Among carrot plants inoculated with six different viruses (10 plants each), signs of infection occurred only with cucumber mosaic and aster yellows viruses, potato latent virus and alfalfa, tobacco, and aucuba mosaic viruses failing to induce symptoms. Seedstalk development was induced in all plants inoculated with the aster yellows virus, in some cases followed by flower production but in none by setting of seed. There was no seedstalk development in any of the other plants.

An analysis of market inspection reports on spoilage of cantaloups and related melons, J. S. WIAINT (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1942, Sup. 138, pp. 145-161).—An analysis of the information on mold and decay reported in 9,890 carlots of melons inspected at New York City during 1933, 1934, 1935, and 1941 included 3,294 carlots of cantaloups, 4,181 of Honey Dew melons, and 2,415 of Honey Ball and mixed melons combined. All originated in Arizona, California, or Colorado and together constituted about one-half of the melons unloaded at New York from those States during the 4 yr. A summary of the different decays and molds is tabulated by years for each type of melon. Specific decays cited on the inspection reports were, in order of their relative

importance, those due to *Rhizopus*, *Alternaria*, *Fusarium*, *Cladosporium*, and *Phytophthora*. Decays or molds, or both, were found in 4,400 carlots, an average of 4.7 percent of the melons in these cars being affected with decay and 4.8 percent with mold. Expressed in terms of all 9,890 carlots, 2.1 percent of all melons inspected were affected with decay and 2.1 percent with mold, or 4.2 percent total spoilage.

The results of 3,380 inspections of cantaloups and 574 of Honey Dew melons made at a large number of markets (1922-28) are also summarized. The melons originated in a number of States and represented only a very small part of those shipped therefrom to the inspection markets during the period. Decay was reported in 879 carlots or 22.2 percent of the total inspected. An average of 10.7 percent of the melons were affected per carlot. Expressed in terms of all 3,380 carlots, an average of 2.4 percent of the melons inspected were reported decayed.

Growth stimulation of peas by tetrachloro-para-benzoquinone, a fungicidal seed protectant, G. L. McNEW. (N. Y. State Expt. Sta.). (*Science*, 96 (1942), No. 2483, pp. 118-119).—Data obtained under controlled conditions (with diseases absent) indicated that tetrachloro-*p*-benzoquinone (under trade name Spergon) serves in the dual capacity of seed protectant and growth stimulant when applied to pea seed. As a growth stimulant for peas, the material should therefore pay dividends irrespective of disease conditions. There is also good circumstantial evidence that lima beans and sweetpotatoes may be similarly stimulated. These observations are deemed of considerable fundamental significance, since they reveal a promising new field of study into fungicides.

Influence of controlled environment and nutrition on the resistance of garden pea to *Fusarium* wilt, W. T. SCHROEDER and J. C. WALKER. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 5, pp. 221-248, pls. 4, figs. 10).—Under controlled nutrition and temperature in sand artificially infested with microconidia and hyphal fragments of *F. oxysporum pisi* race 1, the optimum temperature for disease development in peas was 27°-30° C. instead of 21° as previously reported for infested soil, but air temperature had relatively little influence. When grown in the same nutrient solution (with carbohydrate added) used in the sand culture of the host, the fungus grew best at 28°. Within the range studied, severity of disease development in susceptible plants appeared directly proportional to temperature. The greatest progress of the fungus up the stem occurred in plants growing at the 24° and 21° sand temperatures. Besides the other symptoms in susceptible plants, the lower internodes were significantly greater in diameter than in uninfected control plants. Disease development in homozygous resistant plants varied from off color and very slight incurving of the lower stipules and leaflets at the low temperatures and low nutrient concentration to severe wilting at the very highest concentration and optimum temperature. At high temperatures and low nutrient concentration diseased resistant plants were similar to diseased susceptible plants at the low temperature.

The disease development in either resistant or susceptible plants at various concentrations of nutrient solution depended on the sand temperatures. Using four nutrient solutions differing only in total salt concentration, the time required for complete wilting in susceptible plants at 21° varied directly with the concentration, but in resistant plants it was most severe in the weakest solution and none occurred at the higher concentrations. At 27° disease development was most severe at the highest concentration and least so at the lowest, and no differences in symptoms were observed between susceptible and resistant plants. At the lowest concentration, resistant plants developed a very severe slow wilting, whereas susceptible plants approached the rapid wilting occurrent at the highest

concentration. No differences in fungus growth rates in culture were observed that could account for the differences noted in disease development above described. Extensive cortical and stelar penetration of the roots and stelar penetration above the first and second internodes were found, and more pronounced reactions to the fungus were noted in resistant plants at the high temperatures than in susceptible plants at either high or low temperatures. Cross inoculations of susceptible and resistant varieties of tomato, pea, and cabbage with their respective *Fusarium* wilt fungi under conditions of high temperatures and low nutrient sand culture indicated that the break-down in pea-wilt resistance could be accomplished only with the pea-wilt organism. There are 24 references.

The release of auxin from isolated leaf proteins of spinach by enzymes, S. G. WILDMAN and S. A. GORDON (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 6, pp. 217-228, fig. 1).—Auxin was shown to be associated with proteins isolated from spinach leaves, capable of release by enzymatic hydrolysis and obtainable from both cytoplasmic and chloroplastic proteins. The cytoplasmic proteins were separated into two fractions by isoelectric precipitation, more auxin being obtained from one than from the other. Diffusion tests indicated the similarity between the leaf auxin and that released from proteins by enzymatic hydrolysis, and both appeared to be of lower molecular weight than indoleacetic acid. Evidence is presented that the auxin released from leaf proteins of spinach is not a result of bacterial contamination. There are 16 references.

Breeding for tomato variety resistant to bacterial cancer *Aplanobacter michiganense* E. F. SMITH, K. N. YATZYNA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 32 (1941), No. 5, pp. 372-373).—Promising progress is shown by the first 2 yr. of a breeding program for resistance to bacterial canker (*Phytoplasma michiganensis*) in hybrids of tomato with *Lycopersicon pimpinellifolium*. Among five species of the genus tested for resistance, only *L. pimpinellifolium*, used in these crosses, proved resistant.

Macro-element nutrition of the tomato plant as correlated with fruitfulness and occurrence of blossom-end rot, C. B. LYON, K. C. BEESON, and M. BARRENTINE. (U. S. D. A.). (*Bot. Gaz.*, 103 (1942), No. 4, pp. 651-667, figs. 11).—In sand cultures of 1,044 tomato plants using 87 different nutrient solutions, variations in amounts of Ca and nitrate in the medium resulted in general in greater differences in fruitfulness over wider ranges in concentration than did the other elements tested. Greatest fruitfulness occurred in treatments relatively high in nitrate and low in sulfate and phosphate in the anion triangle and in those relatively high in Ca and low in Mg and K in the cation triangle. The percentage of diseased fruits on each plant increased with decreasing Ca concentrations, this correlation being largely independent of that of Mg and K. No correlation with any anion was observed. Fruits produced under treatments where the rot was most severe were low in Ca and high in K and Mg. The occurrence of blossom-end rot was thus definitely associated with Ca nutrition. There are 25 references.

Tree troubles during a wet summer, P. P. PIRONE (*New Jersey Stas. Nursery Disease Notes*, 15 (1942), No. 2, pp. 5-8).—As a result of the abnormally wet summer of 1942, several diseases occurring ordinarily as sporadic invaders have become common in New Jersey and may be expected to become more widespread during the fall and in 1943. Among them are basal rot (*Phytophthora cambivora*), shoestring root rot (*Armillaria mellea*), and various leaf diseases. Certain observations are also presented on the production of aerial roots on large trees, attributed to the frequent rains.

The effects of leafhopper feeding injury on apparent photosynthesis and transpiration of apple leaves, G. E. MARSHALL, N. F. CHILDERS, and H. W.

BRODY. (Ind. and Ohio Expt. Stas.). (*Jour. Agr. Res.*, 65 (1942), No. 6, pp. 265-281, figs. 5).—Injury to Stayman Winesap apple leaves by several species of apple leafhoppers (*Typhlocyba* spp.), grape leafhoppers (*Erythroneura* spp.), and the potato leafhopper (*Empoasca fabae*) was accompanied by a more or less marked reduction in apparent photosynthesis and transpiration, the former usually being affected sooner and to a greater extent. A given number of potato leafhoppers proved more detrimental to leaf metabolism than an equal number of apple or grape leafhoppers. Cross sections of injured leaves showed that the mesophyll-feeding types of leafhopper (*Typhlocyba* spp. and *Erythroneura* spp.) removed the contents of the cells in the palisade layers, whereas the spongy mesophyll cells were not significantly affected unless the leaf had been severely injured. The results indicate that apparent photosynthesis and transpiration of apple leaves may be reduced early in the growing season when the leafhopper population is moderately low, and when this occurs the capacity of the injured leaves to function normally is permanently impaired. Early control of these insects is therefore important.

Factors affecting distribution and severity of black root rot of apple trees, J. S. COOLEY. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 6, pp. 299-311).—Black root rot of apple is distributed from Pennsylvania to Georgia and westward to Arkansas, but is unknown outside the United States. Its distribution may depend partly on the soil being warm enough for the pathogen (*Xylaria mali*) to thrive, and local distribution is apparently affected by certain conditions adverse to the host. Experimental infection was successful when the inoculum was infected apple twigs, but when a mass of mycelium from an agar culture was used it was not. Wounding was not necessary for infection. In agar cultures one isolate made fair growth at 15° C., but its optimum was about 25°. Roots of stored apple seedlings were infected at 15.5°. Inoculations with 27 isolates indicated a wide variation in pathogenicity. As shown by inoculations of apple, pear, plum, cherry, and peach seedlings, only the apple showed undoubted susceptibility. In tests during 3 or 4 successive years on 19 own-rooted standard apple varieties, 30 seedling clones, and seedlings of 9 named varieties of apples, analysis of variance showed only slight significance for variety in own-rooted varieties, and in the own-rooted seedling clones and variety seedlings there was no significance for variety. Statistical analysis of the infection data (1936-38) showed a significant correlation between infection and high seasonal temperature. The longevity of the fungus in infected apple roots varied. In several experiments the living fungus could not be found a few months after the death of the host, but in some natural infections it survived the host by several years.

Apple scab and bitter rot in Missouri, M. A. SMITH. (U. S. D. A.). (*Missouri State Hort. Soc. Proc.*, 1939-40, pp. 91-97).—A general discussion of these two diseases, with particular reference to their occurrence and control in Missouri.

Apple scab and its control at Glasnevin in 1939, 1940 and 1941, R. McKAY ([*Irish Free State*] *Dept. Agr. Jour.*, 39 (1942), No. 1, pp. 46-79, pls. 6, fig. 1).—The detailed results of spraying experiments and seasonal observations on apple scab for the 3 yr. are reported.

Bacterial diseases of stone-fruit trees in Britain.—VIII, Bacterial canker of peach, H. WORMALD (*Brit. Mycol. Soc. Trans.*, 25 (1942), pt. 3, pp. 246-249, pl. 1).—The organism isolated from the bacterial canker of a peach tree described, when inoculated into peach, plum, and cherry branches, produced typical cankers. It is referred to *Pseudomonas* (= *Phytomonas*) *mors-prunorum*.

A progress report on the yellow-leaf disease of sour cherry, E. J. RASMUSSEN and D. CATION (*Mich. State Hort. Soc. Ann. Rpt.*, 71 (1941), pp. 100-105).—This slow-acting virus disease, present in Michigan for a least 20 yr., is of economic importance because it causes premature defoliation, progressive reduction in spur growth, reduced yields, and shortening of the profitable life of the orchard. Sprays, fertilizers, or culture practices have no apparent effect on the disease. It is transmitted by budding, but the method of orchard transfer has not been proved, though some evidence points to leafhoppers as vectors. Montmorency selections appear to vary in susceptibility. Propagation of nursery trees from disease-free high-producing strains or selections promises to become an important control measure.

Peach X-disease or yellow-red virosis, C. F. TAYLOR. (W. Va. Expt. Sta.). (*Mountaineer Grower*, 13 (1942), No. 138, pp. 15-16).—A brief summary of the present status of this disease, thus far not reported from West Virginia.

Control of X disease of peaches by killing chokecherry weed with ammonium sulfamate, E. M. HILDEBRAND and D. H. PALMITER. (Cornell Univ. and N. Y. State Expt. Sta.) (*Agr. News Letter*, 10 (1942), No. 3, pp. 73-75, fig. 1).—It is claimed that if peach trees are purchased from reliable nurseries, if young plantings are isolated for a minimum of 500 ft. from chokecherries, and if all chokecherries within 500 ft. of bearing orchards are destroyed, X disease as it is known in the eastern United States will cease to be a menace to peach culture.

Kill chokecherries to save peaches from X disease, D. H. PALMITER and E. M. HILDEBRAND (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, pp. 2, 11, fig. 1).—Herbicidal sprays are seen as the best means of destroying the wild hosts of this virus disease.

Currant leaf spot held in check with bordeaux spray, R. F. SUIT (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, p. 5, fig. 1).—Two applications of 3-3-100 bordeaux applied when the fruit is about half grown and again after harvest were found to check defoliation and insure adequate protection against yield losses.

Studies in bacteriosis.—XXV, Studies on a bacterium associated with leafy-galls, fasciations and "cauliflower" disease of various plants—pt. 4, The inoculation of strawberry plants with *Bacterium fasciens* (Tilford), M. S. LACEY (*Ann. Appl. Biol.*, 29 (1942), No. 1, pp. 11-15, pl. 1).—Attempts to produce this disease by inoculating *B. (=Phytophthora) fasciens* into plants grown from runners gave inconclusive results, only 25 percent developing some signs of infection and the majority of these recovering. However, inoculations in seedling strawberry plants gave definite positive results, abnormal growth being produced in 76 percent of them. This organism caused gall production on young plants in the absence of wounds.

Banana leaf spot: When to spray and why, R. LEACH (*Kingston, Jamaica: Dept. Agr.*, 1942, pp. [1]+6, pls. 2).—This is an informative leaflet.

Manganese and zinc deficiencies in coastal citrus trees, R. J. BENTON (*Agr. Gaz. N. S. Wales*, 53 (1942), No. 2, pp. 90, 94, fig. 1).—A note on these deficiencies observed in central coastal areas of New South Wales which responded to combination sprays containing both Zn and Mn.

"Dry root rot" disease of citrus trees, F. C. LOEST (*Farming in So. Africa*, 17 (1942), No. 196, pp. 420-424, figs. 5).—A root disease found responsible for the retrogression and death of many citrus trees throughout the Union of South Africa was shown to result from infection by *Diplodia natalensis*. Contributing factors and prevention and control methods are briefly discussed.

Brown spot of passion fruit (*Agr. Gaz. N. S. Wales*, 53 (1942), No. 2, pp. 93-

94, figs. 2).—A note on *Alternaria passiflorae* infection of leaves and fruits, and on control.

Enfermedad de la "tinta" del castaño [The ink disease of chestnut], P. U[RQUIJO LANDALUZE] (*Estac. Fitopatol. Agr. La Coruña Pub. 14* (1941), pp. 31–38, figs. 15).—This paper reports a study of the disease due to *Phytophthora cambivora* in the Spanish Province of La Coruña, including isolation of the pathogen, inoculations into the host tree, and studies of the life history and morphology of the fungus in culture.

The effect of a mold, *Trichoderma lignorum*, on loblolly pine sapwood, M. S. CHIDESTER. (U. S. D. A.). (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 134–138, figs. 2).—The experimental results reported indicate that wood-inhabiting strains of *T. lignorum* cause a slight reduction in some of the strength properties of pine sapwood.

Carotenoids of telial galls of *Gymnosporangium juniperi-virginianae* Lk., B. L. SMITS and W. J. PETERSON. (Kans. State Col.). (*Science*, 96 (1942), No. 2487, pp. 210–211).

Recent developments in white-pine blister rust control in the Northwest, E. L. JOY (*Northwest Sci.*, 16 (1942), No. 3, pp. 55–58).—A review.

Some resupinate polypores from the region of the Great Lakes, XIII, D. V. BAXTER (*Mich. Acad. Sci., Arts, and Letters, Papers*, 27 (1941), pp. 139–162, pls. 11, figs. 4).—The recent emphasis on aviation has focused attention on types of wood suitable for training planes and plane parts, and among the softwoods Sitka spruce (*Picea sitchensis*) is of prime importance and white spruce (*P. glauca*) less so. Except for certain conspicuous species, however, the common fungi on these spruces have not been critically investigated. The present contribution (E. S. R., 85, p. 358) deals primarily with *Trametes serialis* and *T. alaskana* n. sp., together with allied species of each fungus, and considers their hosts, geographic distribution, cultures, and the decays induced. It is deemed clear from the records given that comparative studies of the species of *Trametes* in culture and of those closely related are necessary, and the variation found among isolates from different regions makes such studies all the more imperative.

Decay in red-stained jack pine ties under service conditions, C. W. FRITZ and E. A. ATWELL (*Canada Dept. Mines and Resources, Lands, Parks, and Forests Branch, Forest Serv., Forest Prod. Labs. Cir. 58* (1941), pp. [2]+19, pls. 7).—Red-staining fungi were not found responsible for decay of either creosoted or untreated ties under track conditions, in treated ties remaining viable but dormant and in untreated ties being gradually killed by secondary fungi. After 10 years' service, untreated ties were in an advanced stage of decay by secondary fungi, the prevalent rot being of the brown cubical type and due to several distinct fungi, with *Lenzites saepiararia* the dominant species. Creosote did not sterilize the ties, but it reduced the viability of the red-staining fungi and proved a great protection to the ties. With the passage of years, however, checks opened up the creosoted shell and permitted the entrance of secondary fungi. A detailed account of the study is given.

Treating fence posts with chromated zinc chloride, W. C. NETTLES. (Clemson Agr. Col.). (*Agr. News Letter*, 10 (1942), No. 3, pp. 65–66, pl. 1).—A note on preservation of fence posts against termites, fungi, and various decays, with directions for treatment.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions in economic zoology and entomology] (*Jour. Council Sci. and Indus. Res. [Austral.]*, 15 (1942), No. 1, pp. 3–9, 37–54, 56–80, figs. 3).—

Contributions presented include the following: Further Observations on the Relation of Tail Length to the Incidence of Blowfly Strike of the Breech of Merino Sheep, by J. H. RICHES (pp. 3-9); Attempted Transmission of *Anaplasma marginale* Theller by Biting-Flies, by I. M. and M. J. MACKERRAS and C. R. MULHEARN (pp. 37-54); The Preparation and Examination of Faecal Cultures for the Differentiation of Larvae of Sheep Nematodes, by H. V. WHITLOCK (pp. 56-58); The Use of Mineral Oils and Tar Oils for Wheat Weevil [Rice Weevil and Red Flour Beetle] Control, by J. S. FITZGERALD, F. N. RATCLIFFE, and F. J. GAY (pp. 59-71); Investigations on the Locust (Grasshopper) Problem, by K. H. L. KEY (pp. 72-77); and Oriental Peach Moth Investigations—General Statement, July 1941 (pp. 77-80).

History, policy, and program of the Huntington Wildlife Forest Station, R. T. KING, W. A. DENCE, and W. L. WEBB (*Roosevelt Wildlife Bul.* [Syracuse Univ.], 7 (1941), No. 4, pp. [1]+388-505, pls. 2, figs. 25).

Flight and running speeds of birds, C. COTTAM, C. S. WILLIAMS, and C. A. SOOTER (*Wilson Bul.*, 54 (1942), No. 2, pp. 121-131).—The results of timings made during the course of field work in various parts of the West of a number of birds whose flight or running speeds had never been recorded and additions to the limited data on record for others are brought together and summarized in tables. The authors' records were made by automobile, from which two or more observers usually checked the speeds.

Parasites of the American coot (*Fulica americana*) in central Iowa, R. L. ROUDABUSH. (Iowa Expt. Sta. et al.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 4, pp. 437-441).—An annotated list of the ecto- and endo-parasites of the American coot in central Iowa, together with information on the number and percentage of hosts infested and references to the literature.

Ecology and management of the mourning dove (*Zenaidura macroura* (Linn.)) in southwest Iowa, H. E. MCCLURE (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 93-95).

Insect food of the rock wren, G. F. KNOWLTON and F. C. HARMSTON. (Utah Expt. Sta.). (*Great Basin Nat.*, 3 (1942), No. 1, p. 22).—An examination of the stomach contents of the rock wren (*Salpinctes obsoletus obsoletus*), a species that is common in the semidesert areas frequented by a number of important insect pests in Utah, has given proof that it feeds upon the beet leafhopper, false chinch bug, Say stinkbug, army cutworm, grasshoppers, and many other pests.

Feeding habits of *Bufo marinus*, J. F. ILLINGSWORTH (*Hawaii. Ent. Soc. Proc.*, 11 (1941), No. 1, p. 51).—Examination of 53 stools of the giant toad (*B. marinus*) in Kaimuki during 5 weeks following March 1, 1940, revealed the Surinam roach to have been the principal food, it varying from 40 to as high as 90 percent of the entire contents. During the period the Chinese rose beetle *Adoretus sinicus* Burm. was on the wing some stools ran as high as 40 to 50 percent of their remains. The Pheidole ant (*Pheidole megacephala*) at times comprised from 10 to 20 percent of the castings. Other insects found were grain beetles (Tenebrionidae), black grass bugs (*Geotomus pygmaeus*), black wasp (*Odynerus* ?), Fuller rose beetle, one honeybee, and one sweetpotato hornworm. The author concludes that the toads are destined to be an important check upon the Surinam roach, which has an important bearing in the Tropics, as it is the intermediate host of the eye worm of chickens.

Field book of snakes of the United States and Canada, K. P. SCHMIDT and D. D. DAVIS (*New York: G. P. Putnam's Sons*, [1941], pp. XIII+365, pls. [35], figs. 103).—Following a brief preface and the introduction (pp. 3-77), is the main part of this work which consists of a systematic account of the snakes

of the United States and Canada, including a key to the genera. The work includes 4 colored plates and 103 drawings by A. A. Enzenbacher and 82 photographs from life. Ten pages are devoted to references to the literature.

Venomous snakes: Some Central American records; incidence of snake-bite accidents, H. C. CLARK (*Amer. Jour. Trop. Med.*, 22 (1942), No. 1, pp. 37-49).—In reporting upon investigations conducted it is pointed out that domestic animals at large on the range are exposed by day and night to snake bite. Mention is made of a report that over a period of 3 yr. snake bite in Texas was responsible for an annual loss of cattle valued at more than 1 million dollars.

General entomology, S. W. FROST (*New York and London: McGraw-Hill Book Co.*, 1942, pp. X+524, [pl. 1], figs. 406).—This work, intended as an advanced text, is presented in 23 chapters, each accompanied by a copious bibliography. Field keys to the immature forms of the orders of insects exclusive of eggs and pupae and to the common groups of lepidopterous and coleopterous larvae, material on classifications of insects, and a list of general entomological texts and other important references are given in an appendix.

Zoology and entomology: Control of insect pests (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, pp. 6, 7).—A practical account by C. Dorman of work with storage insects, boll weevil, and cucumber and melon pests.

[Entomological investigations by the New York State Station] (*New York State Sta. Rpt.* 1942, pp. 35-51, 58).—Progress is noted (E. S. R., 86, p. 506) on insecticides, fruit and vegetable insect investigations, insects attacking nursery stock and ornamental plantings, biological control of injurious insects, and the potato leafhopper and the hopvine borer as hop pests.

Entomology, C. E. PEMBERTON (*Hawaii. Sugar Planters' Assoc. Ptd. Rpts.*, 61 (1941), *Expt. Sta. Com. Rpt.*, pp. 21-27).—The findings, especially in the field of insect control for the year ended September 30, 1941, are noted.

Insects of Guam, I (*Bernice P. Bishop Mus. Bul.* 172 (1942), pp. V+218, pls. 10, figs. 10).—This contribution presents the results of studies of insects collected during a survey conducted in that island in 1936 by O. H. Swezey and several associates under the auspices of the Hawaiian Sugar Planters' Association. The insect pests which were found on various crops were listed with respect to food plants in the contribution which has been noted (E. S. R., 84, p. 358). The findings as reported by specialists, together with descriptions of many new species, are arranged by orders and include Odonata, Thysanoptera, Homoptera, Neuroptera, Lepidoptera, Coleoptera, Strepsiptera, Hymenoptera, and Diptera. The list is said to contain about 50 species not known to occur in Hawaii.

Several important insect pests of cotton.—I, Relation of population to migration. II, Insecticidal studies for their control, J. C. GAINES. (Texas Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 17 (1942), No. 1, pp. 63-65).—This is a report of work conducted over a period of years in the Brazos River bottoms near College Station, Tex., with the boll weevil, cotton flea hopper, bollworm, and flower thrips.

The effect of insect control on the yield and quality of cotton prematurely killed by cotton root rot, S. E. JONES. (Tex. Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 82-84).—In the experimental work reported it was found that low yields from plants prematurely killed by root rot were not materially increased by controlling the flea hopper or boll weevil under the insect conditions existing during the years 1937-39, inclusive. Those plants produced only a small amount of low quality cotton when there was no insect damage. The factor which determines the profit to be made from controlling insects on land where cotton dies from root rot is the yield from living plants,

regardless of the percentage dying early in the season. If the yield from living plants is sufficient for profitable cotton production and insects are damaging the crop, control measures should be used.

Report of fruit insect work in 1939, L. JENKINS, H. E. BROWN, C. W. WINGO, W. W. SMITH, and L. HASEMAN. (Univ. Mo.). (*Missouri State Hort. Soc. Proc.*, 1939-40, pp. 97-99).—The work of the year with the codling moth, oriental fruit moth, and fruit tree leaf roller is reported.

On the estimation of forest insect damage, with particular reference to *Dendroctonus piceaperda* Hopk., R. E. BALCH (*Jour. Forestry*, 40 (1942), No. 8, pp. 621-629).

Two important pests of hickory reproduction in the Southeast, J. A. BEAL and C. L. MASSEY (*Jour. Forestry*, 40 (1942), No. 4, pp. 316-318).—The numerous dead and dying terminal shoots of young hickory trees which came to attention in the Duke Forest in 1939 were found to be largely the result of attack by the twig girdler and the hickory spiral borer *Agrilus arcuatus torquatus* Lec. A small number of specimens of the twig pruner was also found causing damage to hickories. The character and amount of damage to young hickory stands by both species and the results of a study of egg and larval mortality of the twig girdler are reported. Parasites, predators, and associated insects are listed for both species.

Attractants and repellents for insects, [I], II, E. G. THOMSEN and M. H. DONER (*Soap and Sanit. Chem.*, 18 (1942), Nos. 4, pp. 97-99, 105; 5, pp. 95-96, 105).

What kinds of light attract night-flying insects most? least? L. C. PORTER (*Gen. Elect. Rev.*, 44 (1941), No. 6, pp. 310-313, figs. 3).—The results of an investigation of the relative attraction of night-flying insects, including such as enter unscreened porches and/or annoy man, to both equal-wattage lamps (100 w.) and equal brightness lamps (standard, readily available), of various colors (including white, yellow, natural amber, flame-tint, amber-orange, and red), are reported, the number and weight of insects collected at lights of such colors being detailed in tables by families. The insects were attracted more or less by all colors. Photographs are given of piles of insects collected which, as pointed out, do not represent the true value of the lamp attraction since they show the size of insects rather than the numbers. It is indicated that for equal amounts of light, ordinary red light attracts the smallest number of insects, especially of the small gnats that pass through window screens, but red may not attract the lowest weight of insects. It is noted that red light is not a satisfactory color to live or work under, and that for practical purposes yellow is preferable from the standpoint of the size of insects attracted. Use of lower-wattage lamps is considered to be the most effective way to reduce the number of insects attracted. The work was conducted cooperatively by the General Electric Company at Cleveland and the Ohio Experiment Station at Wooster.

Response of insects to color, intensity, and distribution of light. H. L. GUI, L. C. PORTER, and G. F. PRIDEAUX. (Ohio Expt. Sta. et al.). (*Agr. Engin.*, 23 (1942), No. 2, pp. 51-58, figs. 22).—This is a detailed report of the work noted above. The details are given in tables and graphs, together with reproductions of photographs. Lights of all colors tested were found to attract insects to a greater or lesser degree, and none was found to repel insects. The colors on which comparable data are available arrange themselves in order of least to most attractiveness to insects as red, yellow, white, and blue. Bare lamps attract many more insects than do lamps contained within deep-bowl type reflectors or reflector and projector type bulbs. By the utilization of lights of the proper kind and the correct distribution of light, few insects were attracted to the

test area and some may have been drawn away from it. Yellow light, when compared with white light of the same candlepower and brightness, proved to be approximately 66 percent less attractive to insects. It was shown that even though a 15-w. white lamp was used v. a 75-w. yellow, the white lamp still caught more insects. The color produced by the gold fluorescent light was much less attractive to insects than blue fluorescent light.

Studies of contact insecticides.—XVI, Penetration of oils into insect eggs:

(a) Influence of oil characteristics. (b) Influence of age of egg and of species, R. L. BLICKLE (*New Hampshire Sta. Tech. Bul.* 79 (1942), pp. 14, figs. 3).—In continuation of these studies (E. S. R., 86, p. 508), insect eggs were placed in oil saturated with a dye, removed from the oil after definite time intervals, and sectioned. Of the insect eggs tested, penetration of oil was most rapid with eggs of the American cockroach, less rapid with eggs of the Colorado potato beetle, and still less rapid with eggs of the Mexican bean beetle. Low-viscosity petroleum oils penetrated more rapidly than those with high viscosity, while glycerides having the same viscosity as some petroleum oils exhibited somewhat slower penetration. Those petroleum oils of low unsulfonatable residue were observed to penetrate more rapidly than corresponding oils of higher unsulfonatable residue. Apparently refined glycerides penetrated more rapidly than crude. Penetration time decreased with increased temperature above 25° C., but below 25° increase in penetration time was not marked and occurred only with oils of higher viscosity. When immersed in oils for long periods the eggs collapsed, while those placed in distilled water for the same period gained weight.

Some new facts about oil sprays and other dormant treatments containing oil, P. J. CHAPMAN. (N. Y. State Expt. Sta.). (*Mich. State Hort. Soc. Ann. Rpt.*, 70 (1940), pp. 14–20).

All-purpose insect spray, E. M. SEARLS. (Univ. Wis.). (*Soap and Sanit. Chem.*, 18 (1942), No. 5, pp. 97, 99, 101, figs. 3).—It is pointed out that an odorless type AA grade spray made with a highly refined oil base within the distillation range of kerosene may be considered an all-purpose fly spray under average conditions. Such a spray may be used under all conditions where an oil base spray may be used at all. It is sufficiently potent to kill hiding insects as well as flies.

Some internal effects of dinitrophenols on insects, G. B. VIADO (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 146–147).

Application of the aerosol to fumigation.—I, Stabilization of a naphthalene aerosol, W. N. SULLIVAN, L. D. GOODHUE, and J. H. FALES. (U. S. D. A.). (*Pests*, 10 (1942), No. 6, pp. 18–20).—Report is made of toxicity tests against the housefly in the Peet-Grady chamber, in which naphthalene was vaporized both alone and in the presence of smoke from a burning mixture containing cornstarch and sodium nitrate. The effective period of dispersed naphthalene was greatly lengthened by vaporization in the presence of the smoke. This increased effectiveness seems to be due to adsorption of the insecticide on the inert particles. The presence of the inert particles changes the character of the deposit and the rate of crystallization, as well as the size of the crystal. Instead of being collected mostly on the floor, the naphthalene was deposited more uniformly on all surfaces regardless of position. The difference in mortality between the lots of flies exposed to naphthalene with and without smoke was greater in covered than in open cages. A list of 11 references to the literature is included.

Chronic toxicity of derris, A. M. AMBROSE, F. DEEDS, and J. B. MCNAUGHT. (U. S. D. A. et al.). (*Indus. and Engin. Chem.*, 34 (1942), No. 6, pp. 684–689,

figs. 4).—Existing data on the acute and chronic toxicity of derris are summarized, accompanied by a list of 11 references. The results of a study of the chronic toxicity of derris which includes a different strain of albino rats maintained on a different basic diet from that formerly used (E. S. R., 80, p. 369) are presented. The quantity of total extractives and the qualitative and quantitative composition of the extractives were found to be more important factors in the chronic toxicity of derris samples than is the rotenone content. Evidence of liver injury has been found in albino rats receiving daily in the diet a concentration of derris or cube corresponding to 75 parts per million parts of diet. It is pointed out that variations in composition of derris and cube necessitate caution in making sweeping generalizations regarding the toxic properties of derris and cube on the basis of studies on a few samples.

Lower concentrations of rotenone, H. F. WILSON and R. L. JAMES. (Univ. Wis.). (*Soap and Sanit. Chem.*, 18 (1942), No. 3, pp. 93-95, 117).—The data presented, details of which are given in tables, reveal that the rotenone content of agricultural dusts may be safely reduced with a view to conserving the available stock. Early tests indicate that with compatible diluents and optimum application methods significant reductions in rotenone content can be safely made with no loss in kill.

Industrial fumigation against insects, E. A. BACK and R. T. COTTON (*U. S. Dept. Agr. Cir.* 369, rev. (1942), pp. 64, *figs. 38*).—A revision (E. S. R., 75, p. 80).

A dry bait for grasshopper control, L. C. PAUL (*Canad. Ent.*, 74 (1942), No. 5, pp. 77-78).—In experimental tests with nymphal and adult grasshoppers in Saskatchewan and Manitoba during 1940 and 1941 a bait consisting of dry bran sprayed with sodium arsenite was as effective as the standard wet bran-sawdust bait. In both years the tests were made with *Melanoplus mexicanus* (Sauss.) and in 1941 with the clear-winged grasshopper also. It was found that the dry bran bait did not lump or mold over a period of several weeks. When used it was thoroughly dry and could not readily be distinguished from the original untreated bran. The bait spread well, especially with a wind, when, because of its relative lightness, it carried farther than the wet baits. It was prepared by spraying sodium arsenite (8 lb. as As_2O_3 per gallon) directly upon dry bran at the equivalent of 1 qt. of concentrated poison to 100 lb. of bran. By using a spray gun that worked on an air pressure of 40 lb. it was possible to distribute the siruplike concentrated sodium arsenite in a very fine mist. The formation of droplets of fluid on the walls of the apparatus was almost entirely prevented by spraying the poison into the air stream which carried the bran just as the bran entered a large box receptacle; air circulation for better distribution of material was accomplished by placing a fan in this box.

Pyrethrum vs. roaches, F. L. CAMPBELL. (Ohio State Univ. et al.). (*Soap and Sanit. Chem.*, 18 (1942), Nos. 5, pp. 90-93, 103, 105, *fig. 1*; 6, pp. 119, 121, 123, 125, 127, 141).—Presented with a list of 41 references to the literature cited.

The genus *Hesperotettix* in Utah (Orthoptera: Locustidae; Cyrtacanthacrinae), W. W. HENDERSON. (Utah State Agr. Col.). (*Great Basin Nat.*, 3 (1942), No. 1, pp. 9-21, *figs. 3*).

Fecundity, longevity, and parthenogenesis of the American [cock]roach (*Periplaneta americana* L.), J. T. GRIFFITHS, JR., and O. E. TAUBER. (Iowa Expt. Sta.). (*Physiol. Zool.*, 15 (1942), No. 2, pp. 196-209).—In the investigations conducted by the authors parthenogenesis was found to occur in 9 egg capsules formed by 3 out of 25 unmated females of the American cockroach. The phenomenon occurred in 4.5 percent of the well-formed, seemingly normal

capsules produced by virgin females. Unmated females produced many malformed egg cases, which were not retained and were not tested for viability. Increased egg production is correlated with decreased longevity. Females in the first group lived an average of 181 days, those in the second group 218, and virgin females lived 295 days. The average adult life span for the selected group of cockroaches was 225 days for the females and 200 days for the males. Female adulthood varied from 90 to 706 days and that of the male from 91 to 362 days. A maximum of 18 nymphs was found to emerge from 1 egg capsule, but the average number from 121 cases was 12. The incubation period over moist sand was 53 days at room temperature, which fluctuated between 17° and 28° C., and 40 days at 29°.

The effect of temperature upon the development of cockroaches, G. E. GOULD. (Ind. Expt. Sta.). (*Ind. Acad. Sci. Proc.*, 50 (1940), pp. 242-248).—This contribution supplements data on the temperature-development relationship (E. S. R., 84, p. 361) and summarizes findings on six species of cockroaches occurring in homes in Indiana. The three species infesting buildings, namely, the German cockroach, American cockroach, and oriental cockroach, showed a decided similarity in the temperature requirements for development. The temperature range from 74° to 83° F. was the most favorable for incubation and nymphal development. The brown-banded roach required higher temperatures for normal development, while the Pennsylvania woods roach *Parcoblatta pennsylvanica* DeG. responded to lower temperatures. Acceleration of development of all species continued up to 84° and in some cases even higher, although higher temperatures were detrimental to capsule production and shortened the lives of adults.

Roach testing: A progress report describing a new method of testing roach sprays, E. R. MCGOVAN and J. H. FALES. (U. S. D. A.). (*Soap and Sanit. Chem.*, 18 (1942), No. 3, pp. 101, 103, 105, 107, 117, figs. 2).

A new Frankliniella from Florida (Thysanoptera), J. R. WATSON (*Fla. Ent.*, 25 (1942), No. 2, pp. 17-18, figs. 2).—Under the name *F. bratleyi* a thrips taken on bulbs of tuberose at Gainesville is described as new.

A discussion of researches on the sugar-cane froghopper (Homop.: Cercopidae), A. PICKLES (*Trop. Agr. [Trinidad]*, 19 (1942), No. 6, pp. 116-123).—Following the brief introduction, a historical summary, chronologically arranged, is presented. The data are given under the headings of cultivation and manuring, insecticidal methods, biological control, varietal resistance, difficulties met with in froghopper investigations, and suggestions for future investigations. Insecticidal control is said to provide the best means at present of controlling froghopper outbreaks, and the use of "Cyanogas," followed by pyrethrum, is suggested for this purpose. A list of 44 references to the literature is included.

Protecting plants against the insect vector of aster yellows, G. M. LIST. (Colo. State Col.) (*Jour. Colo.-Wyo. Acad. Sci.*, 2 (1940), No. 6, p. 47).—Complete protection from aster yellows, which is transmitted only by the leafhopper *Macrostelus divinus* (Uhl.), was obtained through the use of a 3-ft. muslin fence erected about the plats, 82 percent of the check plants in the open garden having been infected in 1938 and 52.06 percent in 1939.

Host plant records of Cercopidae in North America north of Mexico (Homoptera), K. C. DOERING (*Jour. Kans. Ent. Soc.*, 15 (1942), Nos. 2, pp. 65-72; 3, pp. 73-92).

New Psyllidae from Puerto Rico, with notes on others (Homoptera), J. S. CALDWELL (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 26. (1942), No. 2, pp. 28-33, figs. 6).—Four new species are described, with notes on two others. Figures are included to aid in identification.

The host relation of the cotton flea hopper, E. HIXSON (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 66-68).

Rhamnus alnifolia L'Her., a winter host of *Aphis abbreviata* Patch, one of the aphids feeding upon potato foliage, R. P. GORHAM (*Canad. Ent.*, 74 (1942), No. 5, p. 96).—The aphid survey conducted in New Brunswick during the past 8 yr. has shown that the species *A. abbreviata* occurs quite commonly in a number of places where no species of the common European buckthorn (*R. cathartica*), long known as a winter host plant upon which its eggs are deposited in the autumn, is known to grow. Search for a native species of buckthorn (*R. alnifolia*) that is a common winter host plant in the State of Maine resulted in its discovery in wet pasture land east of Grand Falls in Victoria County, where migrants of this aphid were clustering thickly upon the leaves and stems and oviposition was beginning. A later survey revealed the presence of this host in limited abundance in several places on other farms in the districts infested with aphid eggs. *R. frangula*, a recently introduced European hedge plant in York County, New Brunswick, was also found to serve as a winter host plant for this aphid.

The apple mealybug *Phenacoccus aceris* Sig. and its control by dormant sprays, J. MARSHALL (*Sci. Agr.*, 22 (1942), No. 12, pp. 727-732).—A brief account of this mealybug, which under certain conditions causes considerable losses in fruit districts of Nova Scotia and British Columbia, particularly through its excretion serving as a medium for development of sooty fungus on the fruits, is followed by a report of control work extending over a period of 3 yr. Control has been most readily and economically accomplished by the use of a dormant or delayed dormant application after the immature females have left their wintering cocoons and moved to the twigs and fruit spurs to resume feeding. "Dormant petroleum oil (California crude) of 108 sec. Saybolt viscosity at 100° F. has been more effective than a more viscous oil of 223 sec. or less viscous oils of 44 to 32 sec. From the standpoint of economy, however, an oil of 44 viscosity (Diesel oil) seems preferable to 108 viscosity type. A 6-percent application of Diesel oil has been as effective as a 4-percent application of 108 viscosity oil and costs but two-thirds as much. A mixture of petroleum oil and lime-sulfur appears to have a considerable residual effect that is lacking in oil alone. The greater cost of such a mixture, however, appears to outweigh this advantage. Oil solutions containing 1 or 2 percent dinitrocresol or dinitrocyclohexylphenol were more effective than oil alone. Addition of oxalic acid to lower the pH value of the spray mixture apparently increased the effectiveness of such oil solutions. Water solutions of sodium dinitrocresylate and sodium dinitrocyclohexylphenate proved to be effective against the apple mealybug and less expensive than oil emulsions. The dinitrocyclohexylphenol salt is somewhat objectionable to apply."

The Canadian apple mealybug *Phenacoccus aceris* Signoret and its allies in northeastern America, G. J. RAY (*Canad. Ent.*, 74 (1942), No. 7, pp. 118-125, figs. 27).—This contribution includes an account of the economic importance and taxonomy of *P. aceris*, which first gained entrance from Europe into Maine and has spread into Nova Scotia and British Columbia to become a major pest of apple, cherry, and to some extent currant. A key to and notes on other species of the genus *Phenacoccus* of northeastern America and notes on the parasite *Allotropa utilis* Muesebl. are included.

Status of the friendly fungus parasites of armored scale-insects, E. W. BERGER (*Fla. Ent.*, 25 (1942), No. 2, pp. 26-29).

The relationship of ants and other organisms to certain scale insects on coffee in Puerto Rico, M. R. SMITH. (U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 26 (1942), No. 2, pp. 21-27).—Fourteen species of ants were

noted attending scale insects on coffee, the 3 most common being the fire ant, the little fire ant, and *Brachymyrmex heeri obscurior* For. The hemispherical scale and the green scale were the most important scales, while *Encyrtus infelix* (Embleton) was the most common parasite. This parasite while preparing to oviposit often stroked the scale with her antennae, causing the scale to void honeydew which was lapped up by the wasp. Ingestion of honeydew by ants is described. Certain entomogenous fungi, especially *Cephalosporium lecanii*, appeared to be the principal factors regulating the abundance of coffee scales. Shade, coolness, and moisture favored these fungi, and scales were accordingly less abundant in the normal shady locations.

Seasonal history of the margarodid scale *Matsucoccus bisetosus* Morrison occurring on ponderosa and Jeffrey pines in California (Homoptera: Coccoidea: Margarodidae), H. L. MCKENZIE. (U. S. D. A.). (*Microentomology*, 7 (1942), No. 1, pp. 19-24, figs. 2).—This contribution relates to a scale insect of importance because of its apparent association with decadence in both young and mature ponderosa and Jeffrey pines. *M. bisetosus* attacks members of the so-called pitch- or hard-pine group of trees, including such species as *Pinus ponderosa*, *P. jeffreyi*, *P. sabiniana*, *P. contorta*, and *P. scopulorum*. It is commonly found feeding in twig axils and on the stems of twigs and branches, as well as on the trunks of young pines, and appears to be associated with a necrosis and resining in the twig axils. It is believed that this type of injury may be responsible for the gradual decadence and death of small twigs, and that these dying twigs may ultimately contribute to large branch killing. Excessive branch killing undoubtedly affects the vigor of the host tree. The species is rather widely distributed throughout the pine stands extending from Oregon into California, Arizona, and Colorado.

The mineola moth or destructive prune worm, W. E. SHULL and C. WAKELAND (*Idaho Sta. Bul.* 242 (1941), pp. 7, figs. 7).—The pyralid moth *Mineola scitulella* Hulst, first discovered in Idaho in 1925, is probably now generally present in all prune-growing areas of southwestern Idaho. In the spring overwintering larvae destroy many buds and blossoms of prunes by boring into the unopened buds and eating the floral parts. First-generation larvae feed almost entirely in green prunes, causing them to shrivel and drop. Second-generation larvae attack the fruit before harvest and often occur in packed prunes. First-generation moths start emergence about May 15, while those of the second generation start emergence in July. A few third-brood larvae are produced. Best direct control found is a dormant-type oil emulsion containing pyrethrins, composed of 2.75 pt. of pyrethrum extract and 4 gal. of emulsified oil in 96 gal. of water, applied 2 to 6 days after 95 percent of the overwintering larvae have emerged from their hibernacula.

Control of orange tortrix, A. M. BOYCE. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 27 (1942), No. 8, p. 219, figs. 3).—In supplementing the earlier account of orange tortrix control (E. S. R., 81, p. 818), reference is made to biological studies conducted by A. J. Basinger at the Citrus Experiment Station which have shown that in the intermediate and interior areas there are usually two fairly uniform generations each year. In the coastal areas there are probably three or more generations which overlap considerably, i. e., all stages of the insect may be found at any time of the year. In the warmer areas the two generations differ greatly in the length of their life cycles. The first generation of the year develops in approximately 3 mo., from about the middle of February to about the middle of May. The second generation requires approximately 9 mo. Thus it is evident that the cooler months of the year are most favorable for rapid development of the larvae.

Injury on navels as reflected by fruit drop usually occurs only in the fall and winter seasons, while on Valencias it also occurs throughout the summer. However, during the past several years the greatest amount of injury to Valencia fruits has taken place throughout the summer season. Within recent years Valencias have been commonly held on the trees throughout the summer and into the early fall seasons. Because of this fact the total loss in dropped fruits due to relatively light infestations of the orange tortrix has been greater than formerly. While only a few fruits per tree may drop each week due to tortrix injury the total amount of dropped fruits per tree throughout the entire summer season often represents a considerable loss.

Experimental evidence and commercial usage have shown that this pest can be satisfactorily controlled by cryolite applied as a dust or as a spray. When it is applied as a dust an amount of the dust mixture should be applied to furnish 0.5 lb. of actual cryolite per mature tree. Cryolite may also be satisfactorily incorporated in DN-dust for the combined control of the orange tortrix and the citrus red mite. Furthermore cryolite may be incorporated in DN-sulfur dust, thereby affording a single dust mixture for the combined control of orange tortrix, citrus thrips, and the citrus red mite. The use of cryolite as a spray solely for control of the orange tortrix is seldom practicable. Cryolite is not compatible with lime-sulfur, although it may be used with wettable sulfur.

In the control of orange tortrix on navel oranges a cryolite dust mixture applied during the latter portion of May and early June not only prevents the drop of fruit in the fall and winter seasons but also largely eliminates the scarring by the small tortrix larvae between the buttons of the young fruits.

Achieving 3 percent worm damage, E. GOULD (*Mountaineer Grower*, 13 (1942), No. 138, pp. 7-9, 11-13, 15).—Report is made of the clean-up program applied in a large commercial orchard in West Virginia in which, due in large part to ineffective spraying, the codling moth population had built up and its control in many other orchards throughout the area had become increasingly difficult. Other factors responsible for this build-up included weather conditions during the several years preceding that were unusually favorable to the moth, the omission of second-brood sprays due to the spray residue limitations, under-equipment, improper timing of spray applications, ineffective application, and the use of less toxic insecticides. A table given which shows the amount of spray materials used during the years 1935-41, inclusive, gives evidence of the recognized seriousness of the increasing losses being caused by the pest. By 1935 the losses became so serious that an increased control effort was necessary. The results of the steps taken to reduce the losses in this orchard are shown in the tabulated summary. The cost of spray materials per acre which increased from \$8.32 in 1935 to \$13.89 in 1938 and \$23.65 in 1939 resulted in a reduction of the infested fruit from 50 percent in 1938 to 20 percent in 1939 and 10 percent in 1940. In 1941 the cost of materials was only \$11.97 per acre and the infestation had been reduced to approximately 3 percent. Estimated on an orchard basis, there were 47,000 bu. more uninjured fruit produced in 1941 than in 1938 and at no increased cost. There was every reason to believe that this light infestation could be held at the present low level by careful effective use of lead arsenate.

Codling moth studies, E. GOULD (*Mountaineer Grower*, 12 (1941), No. 128, pp. 33-35, 37-38).

Correlation of sugar yields with the percent of joints bored by *Diatraea saccharalis* (F.)—sugarcane borer studies, I, J. W. WILSON (*Fla. Ent.*, 25 (1942), No. 2, pp. 19-24, fig. 1).

Entomological work: Progress report, B. L. MITCHELL and E. O. PEARSON (*Empire Cotton Growing Corp., Expt. Stat. Prog. Rpts., 1940-41, pp. 166-187, figs. 5*).—Investigational work of the year with the red bollworm *Diparopsis castanea* Hmps. is reported.

Protecting market sweet corn from the European corn borer, W. A. BAKER, D. D. QUESTEL, and C. H. BATCHELDER (*U. S. Dept. Agr. Leaflet 225 (1942), pp. 7, figs. 4*).—A practical account.

Tomato fruitworm control, J. L. HOERNER. (Colo: State Col.). (*Jour. Colo.-Wyo. Acad. Sci., 2 (1940), No. 6, pp. 44-45*).—Of the six insecticides tested against the tomato fruitworm in the Arkansas Valley, Colo., a dust composed of 50 percent cryolite and 50 percent talc gave the best control, with 1.9 percent for the first picking, 4 for the last picking, and 2.3 percent wormy for the season average for 1938. Of the seven insecticides tested in 1939, cryolite and talc again gave the best control, followed by corn meal and cryolite broadcast over the plants, which gave almost equal control. At the second picking on September 11 the untreated plats gave 1.3 percent, the last picking October 9 5.9, and the season average 3.3 percent wormy. The two liquid sprays tested gave a higher percentage of wormy tomatoes than the untreated plats.

Mineral-oil treatment of sweet corn for earworm control, G. W. BARBER (*U. S. Dept. Agr. Cir. 657 (1942), pp. 16, figs. 6*).—A practical account.

Proceedings and papers of the twelfth annual conference of the California Mosquito Control Association, edited by H. F. GRAY (*Calif. Mosquito Control Assoc., Ann. Conf., Proc. and Papers, 12 (1941), pp. [3]+143, figs. 5*).—The proceedings of this conference (*E. S. R., 85, p. 647*), held at Berkeley, Calif., December 15-16, 1941, are reported. The symposium on encephalitis included Relationship of the St. Louis and the Western Equine Viruses of Encephalitis to Man and Animals in California, by B. F. Howitt (pp. 3-22) (*E. S. R., 87, p. 566*); Newer Developments in Knowledge of Insect Hosts and Vectors of Western Equine and St. Louis Encephalitis, by W. C. Reeves (pp. 23-36); and Animal Reservoirs, General Epidemiological Summary, and Possible Control Measures for the American Summer Encephalitides, by W. M. Hammon (pp. 37-51) (all Univ. Calif.), each of which is followed by discussions. Military mosquito control in World War I is discussed by S. B. Freeborn (pp. 56-61), Federal aid in mosquito control work by R. H. Creel (p. 62), and Mosquito Breeding and Control in the Vicinity of Military Zones, by R. F. Peters (pp. 62-69); A Review of Selected Literature Pertaining to Mosquitoes in 1940-1941, by W. C. Reeves (pp. 75-98) (Univ. Calif.); Changes in Legislation Affecting Mosquito Control Operations, by H. F. Gray (pp. 100-110); and Mosquito Breeding in Certain Cemeteries in Alameda County, California, by T. F. Kelley (pp. 111-121) are presented. The symposium on operating problems (pp. 123-136) includes discussion on power spraying by R. Bendel, larvicides by E. C. Robinson, mosquito fish by A. M. Emerick, annexation by H. Lilley, controlled re-flooding by H. Pangborn, rice field control by F. M. Butler, and cash basis fund by H. F. Gray.

Mosquito light trap catches from ten Iowa cities, 1940, J. A. ROWE. (*Iowa Expt. Sta.*). (*Iowa State Col. Jour. Sci., 16 (1942), No. 4, pp. 487-518, figs. 9*).

Emergence habits of the Clear Lake gnat, A. W. LINDQUIST and C. O. DEONIER. (*U. S. D. A.*). (*Jour. Kans. Ent. Soc., 15 (1942), No. 4, pp. 109-120, figs. 2*).—This is a contribution on the emergence of this gnat from Clear Lake, Calif. An account of this pest by Herms has been noted (*E. S. R., 78, p. 80*).

New Dolichopodidae from Utah and Colorado (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (*Utah Expt. Sta.*). (*Canad. Ent., 74 (1942), No. 5, pp. 80-85, figs. 10*).

New North American Tachinidae belonging to the genera *Microchaetina* and *Hypenomyia*, with key to the known species (Diptera), H. J. REINHARD. (Tex. Expt. Sta.). (*Canad. Ent.*, 74 (1942), No. 5, pp. 88-91).

Hawaiian Sarcophagidae, H. DE SOUZA LOPES (*Hawaii. Ent. Soc. Proc.*, 11 (1941), No. 1, pp. 53-56).—Six species representing the genera *Ravinia*, *Hystriocnema*, and *Sarcophaga* are reported from Hawaii.

Zinc oxide: A new larvicide for use in the medication of cattle for the control of horn flies, W. G. BRUCE. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 3, pp. 105-107).—Report is made of experiments conducted to determine the value of zinc oxide in preventing the development of larvae of the hornfly in cattle droppings. When various quantities of the chemical mixed with bran were fed to cattle the minimum effective dose was 1.5 gm. per 100 lb. weight of the animal. This dose rendered the droppings unfavorable for the development of hornfly larvae for 24 hr. beginning 20 hr. after administration. When zinc oxide was mixed directly with the droppings the minimum lethal dose was 0.01 gm. for each 100 gm. of droppings.

Acidified nicotine sprays for horn flies on cattle, W. G. BRUCE. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 4, pp. 120-123).—In experiments on the toxicity of nicotine sprays for the horn fly, nicotine lactate, an aqueous solution of nicotine containing 0.5 percent of nicotine and 1.0 percent of lactic acid, and the combination of nicotine sulfate and acetic acid were effective, but the latter was objectionable because of its disagreeable odor. When certain acids were incorporated in the nicotine sprays the toxicity was prolonged, and the spray was considerably more effective against horn flies than when no acids were added.

Bionomics and morphology of the black onion fly *Tritoxa flexa* (Wied.) (Diptera: Ortalidae), H. C. MANIS (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 96-98).—A digest of a thesis on *T. flexa*, which in Iowa is as serious a pest of onions as is the onion maggot in the onion-growing localities of Pleasant Valley, St. Ansgar, and Clear Lake.

Tests with various chemicals for the control of white grubs in forest nurseries of the Carolinas, H. R. JOHNSTON and C. B. EATON. (U. S. D. A. et al.). (*Jour. Forestry*, 40 (1942), No. 9, pp. 712-721).—Investigations commenced in 1934 with the view to developing a satisfactory means of controlling white grubs (*Phyllophaga* spp.) in forest nurseries of the Southeast revealed acid lead arsenate as too injurious to pine seedlings to be used for such a purpose. In later tests certain other chemicals were found to be more satisfactory, carbon disulfide being more effective than the other materials.

Notes on beetles related to *Phyllophaga* Harris, with descriptions of new genera and subgenera, L. W. SAYLOR (*U. S. Natl. Mus. Proc.*, 92 (1942), No. 3145, pp. 157-165, pl. 1).—The data presented and the conclusions drawn are the result of a critical study of 543 species of phyllophagan beetles from North, South, and Central America and the West Indies.

Japanese beetle continues on offensive in New York, E. H. WHEELER (*Farm Res. [New York State Sta.]*, 8 (1942), No. 4, p. 12).—A practical account

Japanese beetle control in Indiana, F. N. WALLACE (*Ind. Acad. Sci. Proc.*, 50 (1940), pp. 16-22).

Biology of the squash blister beetle, W. R. HORSFALL. (Ark. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 15 (1942), No. 3, pp. 93-99).—A study of the life cycle of the squash blister beetle *Henous confertus* Say in Arkansas, where it was a pest of importance in the northwestern part of the State in the summer of 1939 and of less importance the following year, is reported. In addition to squash,

flowers of several species of cucurbits and those of alfalfa and the western daisy are preferred sources of food. Ripe tomato fruits are also injured.

The flatheaded apple tree borer (*Chrysobothris femorata* (Olivier)), F. A. FENTON (*Oklahoma Sta. Bul.* 259 (1942), pp. 31, figs. 12).—Under Oklahoma conditions for 1935 and 1936, 89.9 and 87.2 percent, respectively, of the flatheaded apple tree borers completed their life cycles in 1 yr., 8.9 and 12.1 percent required 2 yr., and 1.2 and 0.7 percent 3 yr. Emergence from infested wood begins early in May and continues until early August. Adult survival under laboratory conditions averages 26 days. The adults feed on tender bark and may bite through leaf petioles. Females begin oviposition in from 4 to 8 days after feeding and prefer weak trees, inserting the eggs in cracks or wounds. Hatching occurs in 6 to 8 days, and larvae develop in the cambium layer. Larvae overwinter in the xylem, and the majority pupate in the spring. The pupal stage lasts from 8 to 14 days. Trees or tops of trees die as a result of girdling by this insect. The peak of abundance in Oklahoma was reached in 1936 and 1937. After this, natural agencies caused the borer to be scarce. Tree paints are not recommended for control. Best protection resulted from the use of spiral tree wraps extending a few inches below ground level, put in place early in May and removed about October 1.

A revision of the North American species of buprestid beetles belonging to the tribe Chrysobothrini, W. S. FISHER (*U. S. Dept. Agr., Misc. Pub.* 470 (1942), pp. 275, figs. 126).—This publication deals with 7 species of *Actenodes* and 115 species of *Chrysobothris*, of which 7 new species are described. The important synonymy, a description, the type locality, distribution, and host plants if known are given for each species. Notes and records are included for all the species in these genera found on the mainland of America, north of Mexico, as well as those occurring in Lower California. Mention is made of unrecognized and fossil species. Numerous figures are given to aid in the determination of the different species.

Larval characteristics of certain elm bark infesting Coleoptera, P. P. WALLACE and R. L. BEARD. (Conn. [New Haven] Expt. Sta.). (*Canad. Ent.*, 74 (1942), No. 5, pp. 86-87, figs. 3).

Cotton or boll weevils, J. L. WEBB (*U. S. Dept. Agr., Misc. Pub.* 484 (1942), pp. II+16, figs. 10).—A practical account, written especially for boys and girls, which supersedes Miscellaneous Publication 35 (E. S. R., 61, p. 156).

Factors affecting the usefulness of honeybees in pollination, G. H. VANSSELL. (Coop. Univ. Calif.). (*U. S. Dept. Agr. Cir.* 650 (1942), pp. 32, figs. 10).—Honeybees constituted 62 percent of blossom visitors and were practically the only distributors of pear pollen in the Camino district of California. Emasculated blossoms were visited frequently. A wide range in the quantity of nectar secreted and its sugar concentration was noted in different species of plants. Simultaneously blossoming plants must compete for insect visitors. Bees may go a mile and a half or more from well established colonies in search of nectar and pollen. One bee visited 84 pear blossoms to obtain her full load of pollen. It was estimated that on a good flight day 822,720 bees issued from 16 colonies in one pear orchard. Strong overwintered colonies surpassed package bees in population, flight activity, and amount of pollen gathered, and 5-lb. packages were more effective than smaller units.

One year and two year old queens, E. BRAUN (*Amer. Bee Jour.*, 82 (1942), No. 8, pp. 356-357).—A contribution from the Dominion Experimental Farm, Brandon, Manitoba.

Growth factor requirements of *Bacillus* larvae White, A. G. LOCHHEAD (*Jour. Bact.*, 44 (1942), No. 2, pp. 185-189).—It was found that *B. larvae*, hereto-

fore successfully cultivated only on media containing addenda of "natural" substances, grows well on a medium containing salts-sugar solution, peptone, and thiamin. Thiamin completely replaced the growth factor effect of such addenda as vegetable extract, yeast, or egg yolk. Other growth factors, namely, biotin, vitamin B₆, pantothenic acid, inositol, nicotinic acid, and riboflavin, were without effect, nor did they increase the effect of thiamin in promoting growth either singly or in combination.

Biological control of black scale, H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 27 (1942), No. 10, pp. 266, 290-291, figs. 7).—Report is made of progress of black scale control following an extended field survey of the black scale situation in all of southern California, which has shown that in the coastal areas, including all of Santa Barbara, Los Angeles, and Orange Counties and most of Ventura and San Diego Counties, black scale populations have in the past two seasons been the lowest in many years. Almost no insecticidal treatment has been necessary to combat this scale in these areas during that period. While in certain more interior areas a few medium to heavy infestations occur and in certain areas there are many heavily infested groves, the almost unbelievably low populations of black scale in southern California as a whole are most striking. The establishment of the black scale parasite *Metaphycus helvolus* is considered mainly responsible for this control.

Biological control of black scale in southern California, H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Citrus Leaves*, 22 (1942), No. 7, pp. 5-7, figs. 6).—Essentially noted above.

Mortality of reproduction defoliated by the red-headed pine sawfly (*Neodiprion lecontei* Fitch), J. A. BEAL (*Jour. Forestry*, 40 (1942), No. 7, pp. 562-563).—Observations on the killing of young pine trees as a result of defoliation by the red-headed pine sawfly are reported. Additional information on relative survival and susceptibility of shaded and unshaded trees is also presented. The observations were conducted during a local outbreak of this pest in some of the young stands of shortleaf pine (*Pinus echinata*) and loblolly pine (*P. taeda*) in the Duke Forest in 1939.

A comparative study of the influence of temperature on the development of certain sawflies after hibernation in the cocoon, A. W. A. BROWN and L. DAVIAULT (*Sci. Agr.*, 22 (1942), No. 5, pp. 298-306, figs. 10).—A study was made of four species of *Neodiprion* and two each of *Pikonema* and *Pristiphora* to determine the characteristic reaction of the various species to the conditions of temperature and humidity to which they are subjected in the laboratory. The results obtained in the course of this study represent 2 yr. of experimental work carried on with some 10,000 cocoons as a basis for further comparative studies of thermal requirements. The findings, which are summarized in a series of graphs for each of the eight species studied, are considered to warrant the following conclusions: "(1) In most cases the value of the thermal constant is slightly higher for females than for males. Values for the theoretical threshold are nearly the same for both sexes, varying either way (2) As a class, the genus *Neodiprion* is characterized by a high theoretical threshold and a comparatively low thermal constant. In other words, this group requires higher temperature to start development but emergence follows in a relatively shorter time. (3) The highest theoretical thresholds—and lowest thermal constants—are exhibited by *N. lecontei* Fitch and *N. dubiosus* Schedl. Both of these species show a preference in the field for open-grown trees, where the ground is rapidly heated in the spring by isolation. . . . (4) The optimum temperature, as far as survival is concerned, lies in the vicinity of 22° C. (72° F.) for the species of *Neodiprion* studied; for those of the genera *Pristiphora* and *Pikonema*, it is in general lower. (5) By con-

trast, the genus *Pikonema* is characterized by a low theoretical threshold and a high thermal constant. Indeed, the theoretical threshold of *P. ditmuckii* is less than 1° above the freezing point. . . (6) Cocoons of *Pristiphora geniculata* have temperature characteristics resembling those of *Pikonema*, but the material of *Pristiphora ericksonii*, perhaps in contrast to some established opinions, exhibited the high theoretical threshold and lower thermal constant characteristic of *Neodiprion*."

Recently discovered mite on citrus, E. A. MCGREGOR. (U. S. D. A.). (*Calif. Citrog.*, 27 (1942), No. 10, p. 270, figs. 5).—Through feeding within the bracts, *Tarsonemus bakeri* Ewing causes the tips of citrus buds to become brown and dead. In certain orchards in San Diego County this minute mite and the larger bud mite (*Eriophyes sheldoni* Ewing) are present on the same trees, but the malformations of the foliage and fruits caused by the latter are rather easily distinguished from the distortion associated with the tarsonemid mite. *T. bakeri* has been observed on Eureka and Lisbon lemon, navel and Valencia orange, and on grapefruit. Its distribution includes six counties and involves a north-and-south extension of about 155 miles. This mite seems to be closely associated with and may be instrumental in spreading the *Alternaria* fungus, which is known to be the direct or contributing cause of black rot, center rot, end rot, break-down, and similar conditions.

Mites and apple maggot, R. HUTSON (*Mich. State Hort. Soc. Ann. Rpt.*, 70 (1940), pp. 11-14).

Orchard mites and the mealy bug problem, W. S. HOUGH (*Mountaineer Grover*, 12 (1941), No. 128, pp. 10-11, 13).

Ticks collected on the Tama (Iowa) Indian Reservation, with notes on other species, G. W. EDDY and C. R. JOYCE. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 4, pp. 539-543).—Report is made upon the Ixodoidea known to occur in Iowa.

A new species of tick found on shrews, J. D. GREGSON (*Canad. Ent.* 74 (1942), No. 8, pp. 137-139, figs. 9).—An ixodid collected in all stages from shrews in some 10 localities in British Columbia is described as new under the name *Ixodes soricis*. The species in all its stages appears to be specific to shrews, these animals being but rarely parasitized by *I. angustus* Neum., the adult, nymphal, and larval stages of which were found on squirrels, rabbits, moles, rats, mice, chipmunks, and dogs.

Life history studies on two trematodes of the subfamily Notocotylinæ. E. C. HERBER (*Jour. Parasitol.*, 28 (1942), No. 3, pp. 179-196, figs. 25).—This contribution deals with life history studies on two species of trematodes parasitic in mammals and birds which have been completed experimentally, namely, *Quinqueserialis quinqueserialis* and *Notocotylus stagnicolæ* n. sp. The definitive hosts of *Q. quinqueserialis* are *Ondatra zibethicus*, *Microtus pennsylvanicus*, and *Zapus hudsonius*. The definitive hosts of *N. stagnicolæ* are *Gallus domesticus*, *Anas domestica*, *Querquedula discors*, *Mergus merganser*, and *Aegialitis semipalmata*.

ANIMAL PRODUCTION

Livestock production, W. H. PETERS (*New York and London: McGraw-Hill Book Co.*, 1942, 1 ed., pp. VIII+450, figs. 101).—General directions are given for the production, breeding, feeding, management, and judging of beef and dairy cattle, swine, sheep, goats, horses, and mules.

Problems in feeding and management of livestock (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, pp. 5, 6).—Results are briefly reported by C. Dorman on studies of natural breeding and artificial insemination of mares; corn, oats,

barley, and sweetpotato meal for finishing pigs; cottonseed meal feeding with charcoal and minerals for pigs; cottonseed cake, oats, barley, dried sweetpotatoes, soybean-sorghum silage, and kudzu hay for finishing and wintering beef cows; pastures and vitamins for laying hens; egg coolers; and one mash for chickens of all ages.

The physiological approach to livestock nutrition problems, L. A. MAYNARD. (Cornell Univ.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 179-188).—There are pointed out contributions of the physiologist to the fundamental nutrition problems, including the importance of dietary interrelationships in protein, carbohydrate and fat metabolism, and the role of minerals and vitamins, natural and synthetic. The soundness and promise of the physiological approach to livestock nutrition problems is emphasized.

Calories in wartime, E. G. RITZMAN (*New Hampshire Sta. Cir.* 62 (1942), pp. 16).—Conclusions based on many years' results of cooperative research between the station and the Nutrition Laboratory of the Carnegie Institute showed that the returns that may be expected from livestock will depend on the proportion of available nutrients above maintenance requirements. Material savings of concentrates for animals may be made by a better exploitation of forage possibilities. Examples with timothy hay, oats, and soybeans, cut at optimum stages for feed value, are presented. Adequate amounts of proteins and energy alone are not necessarily sufficient for young animals.

Direct methods of computing rations, B. H. SCHNEIDER. (W. Va. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 246-255).—Six direct methods of computing livestock rations which eliminate part or all of the trial-and-error element in compounding feeds are presented. It is suggested that the trial of these methods under many practical and experimental conditions may develop the best method applicable to all conditions.

The nutritive value of animal proteins: The biological values of fishmeal, whale and fishmeal, meatmeal, meat and bonemeal, crayfishmeal, and white fishmeal, B. A. DU TOIT and D. B. SMUTS (*Onderstepoort Jour. Vet. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 191-198).—Biological values were ascertained with six rats each over a period of about 1 week after a low nitrogen ration and transition period, of 94 for whitefish meal, 81 for crayfish meal, 71 for fish meal, 67 for meat meal, 67 for meat and bonemeal, and 63 for whale and fish meal.

The relative efficiency of urea as a protein substitute in the ration of ruminants, B. C. JOHNSON, T. S. HAMILTON, H. H. MITCHELL, and W. B. ROBINSON. (Univ. Ill.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 236-245).—Digestion and metabolism experiments were carried out with 16 growing lambs, comparing the nitrogen utilization from soybean meal, casein, and urea as supplements of roughly 10, 12, and 14 percent crude protein to a basal ration. These results showed that additions of urea to produce the equivalent of 12 percent crude protein induced a retention of nitrogen that was not improved by further urea additions, although it was improved by raising the crude protein content of the ration. Conversion of urea in the paunch does not proceed at a sufficiently rapid rate to comply with the protein requirements in the growing lamb. The utilization in digestion of urea nitrogen was enhanced by available sugar such as corn molasses. Nitrogen from soybean meal was somewhat better utilized than nitrogen from casein. The biological value of the nitrogen in the rations containing 10-12 percent crude protein generally varied within a few percent from 60, suggesting that a considerable portion of the protein utilized by the ruminant is micro-organismal regardless of the nature of the

nitrogenous constituents consumed. For the study there was employed a basal ration consisting of redtop hay and corn with the various supplements.

Studies on carotene in relation to animal nutrition, I, II, P. A. SESHAN and K. C. SEN (*Jour. Agr. Sci. [England]*, 32 (1942), No. 2, pp. 194-216).—Two papers in this series are presented.

I. The technique of carotene estimation in feeding stuffs (pp. 194-201).—A modified method of estimating carotene content of plant material is suggested, which involves a combined aqueous and alcoholic potash hydrolysis before extracting. This method proved relatively efficient.

II. The development and distribution of carotene in the plant and the carotene content of some common feeding stuffs (pp. 202-216).—The absence of sunlight caused poor development of carotene in plants grown under artificial conditions. In the growth of corn and barley there were increases in the former to 58.4 mg. per kilogram and 31.4 in the latter at 12 days of age. At 3 weeks field growth the cereal plants had increased materially but declined thereafter. The carotene contents of green fodder plants and dry feeds commonly used in cattle rations are presented.

The carotene content of some South African feeds, III, S. J. MYBURGH (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 199-210).—Further studies (E. S. R., 85, p. 801) of the carotene content of samples of six grasses taken at monthly intervals from three areas on South African ranges are presented. The calculated intake of carotene by 800-lb. cattle did not indicate a carotene deficiency of cattle on the ranges.

Digestibility studies with ruminants.—IX, Associative digestibility of grains: Wheat bran, gluten feed, and soybean oil meal, C. J. WATSON, J. A. CAMPBELL, W. M. DAVIDSON, C. H. ROBINSON, and G. W. MUIR (*Sci. Agr.*, 22 (1942), No. 9, pp. 561-570).—Continuing this series (E. S. R., 87, p. 257), the calculated digestibility of a grain mixture of wheat bran, gluten feed, and soybean meal was practically the same as that determined by the amounts of each ingredient fed to five steers.

The ensilage of citrus fruit pulp, A. BONDI (*Empire Jour. Expt. Agr.*, 10 (1942), No. 38, pp. 89-92).—Citrus fruit pulp was ensiled in barrels without serious deterioration for as long as 8 mo. and without the addition of acid preservatives. The composition of orange and grapefruit pulp before and after ensiling is given.

Sugarcane silage, shocked sugarcane, and carpet grass as roughages for wintering the beef herd, W. G. KIRK and R. M. CROWN (*Florida Sta. Bul.* 373 (1942), pp. 19, figs. 4).—Storing shocked sugarcane with butts on the ground against upright supports proved practical, but it should not be stacked more than 20 ft. deep for more than a few weeks. Cows wintered on the shocked sugarcane were in a thriftier condition and gave advantageous gains over those wintered on sugarcane silage or on carpet grass pasture with cottonseed meal fed as a supplement. In three experiments shocked sugarcane proved superior to the silage in chemical composition and the gains made by lots of about 10 cows. On combining 3-yr. results, the rations of sugarcane silage, shocked sugarcane, and carpet grass pasture, fed with about 2 lb. of cottonseed meal daily, were found to produce respective average losses per cow of 44, 4, and 78 lb. A preliminary test of 1 yr. showed similar results.

Forest grazing and beef cattle production in the Coastal Plain of Georgia, H. H. BISWELL, B. L. SOUTHWELL, J. W. STEVENSON, and W. O. SHEPHERD (*Coop. U. S. D. A.*). (*Georgia Coastal Plain Sta. Cir.* 8 (1942), pp. 25, figs. 10).—A survey of 106 farms in the Coastal Plain region of Georgia, where cattle are raised and where forest ranges are used for grazing, showed that forest lands

contributed a large part of the yearlong sustenance. The breeding cows usually lost considerable weight on the range after October 15. Calf crops of 40-70 percent were produced. Profitable beef cattle production in the region may occur with tick eradication and better management, and breeding. For grazing cut-over forest lands certain management practices and burning seem to need attention.

Maximum beef production from mountainous summer range in Utah, I. A. STODDART (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 3, pp. 6-7, figs. 5).—The important features of beef cattle management on Utah mountain ranges are briefly presented. Results of 6-yr. grazing at different intensities with suggestions on the economics of the practices are included.

Beef improvement begins at home, F. MCKENZIE (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 3, p. 2, fig. 1).—Plans of the station for finding superior blood lines of beef cattle for the State are presented.

More beef from the same number of cattle on Nevada ranches, C. A. BRENNEN and C. E. FLEMING (*Nevada Sta. Bul.* 162 (1942), pp. 13, figs. 4).—It is suggested that in a well planned program of breeding, feeding, and grazing cattle to increase production, calves should be dropped near the start of the grazing season and kept gaining by supplemental feeding of hay and temporary pastures until marketing.

Purchasing feeder cattle, G. A. BRANAMAN (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 65-68, fig. 1).—It is concluded that "under present war emergency conditions, it is important to buy on a strict grade basis with definite concern for the price ceilings in effect for each grade of beef."

Legume silage vs. corn silage vs. legume hay for fattening calves, G. A. BRANAMAN and G. K. DAVIS (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 13-16).—In a 196-day feeding experiment with 3 lots of 10 400-lb. calves each, average daily gains of 1.95, 1.84, and 2.08 lb. were made by groups receiving legume hay, corn silage, and legume silage, respectively, with beet pulp molasses. The gains in weight and market finish were superior for those fed molasses legume silage to those receiving legume hay. Less shelled corn was required with corn silage than by the cattle in either of the other two lots. Returns per head, including pigs, were calculated considerably greater for the legume silage and corn silage groups.

The importance of body weight in selection of range ewes, C. E. TERRILL and J. A. STOEHR. (U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 221-228).—The yearling fall weights over a 15-yr. period of 758 ewes of Rambouillet, Columbia, and Corriedale breeds were found to be an indication of the number and weights of lambs produced in the succeeding 4 yr. The ewes of each breed were classified into 3 groups by weight, and selection on the yearling body weight had about the same effectiveness, from 13 to 15 lb. of lamb weaned per year, in the 4 yr. regardless of the breed. Lifetime body weights of ewes were inversely proportional to the weights of the lambs produced. Lifetime production of fleece weight was in favor of the heavier ewes, but there was practically no difference in the lifetime fleece length.

Relationship between weanling and yearling fleece characters in range sheep, E. M. POHLE. (U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 229-235, fig. 1).—The length of staple and percentage of clean wool produced by 170 yearling Rambouillet ewes could be predicted from these characters in the weanling fleeces from the formula $Y = a + Xb_{.1}$, wherein Y refers to the yearling values and X those for the weanling animals. Fineness and density showed limited predictive value. One sample was essentially as good as two for estimating clean yield, density index, and staple length, but four samples were

materially more reliable than two samples for predicting yearling fleece length in the Columbias.

A study on the possibility of cystine synthesis in the rumen of sheep together with the effect of cystine supplementation on the nitrogen utilization of lucerne in young stock, D. B. SMUTS, B. A. DU TOIT, and J. G. v. d. WATH (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 181-190).—The biological value of rumen ingesta from sheep was shown in experiments on rats to be greater than that of alfalfa. The biological value of the rumen ingesta was significantly enhanced when supplemented with cystine. In studies with mature sheep, the inclusion of cystine in an alfalfa ration did not influence biological value, although this was increased about 10 percent in growing sheep.

The digestibility of citrus feeds, A. BONDI and H. MEYER (*Empire Jour. Expt. Agr.*, 10 (1942), No. 38, pp. 93-95).—In digestive experiments with sheep the feeding value of orange pulp silage was about 16 percent higher than that of whole cull oranges. It should be noted that the citrus feeds are relatively low in protein.

The feeding of western lambs, W. G. KAMMLADE, E. K. FAULKNER, and U. S. GARRIGUS. (Ill. Expt. Sta.). (*Sheep and Goat Raiser*, 22 (1942), No. 12, pp. 16-18, fig. 1).—No indication was obtained of a benefit in lamb production from additions of cobalt or a mineral mixture to the ration of shelled corn and alfalfa hay with corn silage and soybean meal in a 90-day feeding experiment. In all of the 5 lots of about 45 lambs each, average daily gains were similar. More economical gains were made with corn silage and a protein supplement than with alfalfa hay because of the higher cost of the latter roughage. The 91 lambs not ready to market at the end of the feeding experiment were half shorn and half unshorn. During a 35-day feeding period those shorn made average daily gains of 0.22 lb., whereas those unshorn made average daily gains of 0.20 lb. Calculation of the returns from 7.9 lb. of wool produced by the shorn lambs and the sale of the meat showed no definite advantage of shearing lambs before feeding.

The lipids of the duodenal mucosa of swine during the absorption of fat, R. REISER. (N. C. Expt. Sta.). (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 109-114).—Analyses of the alcohol-ether extract of the mucosa of five 225-lb. Duroc-Jersey pigs after 48 hr. fasting in comparison with the mucosa of similar pigs 2 and 3 hr. after consumption of 200 and 300 gm. of cottonseed oil showed no changes in the phospholipid or cholestereol content of the mucosa during absorption. About 2.5 percent of the duodenal mucosa of the fasting pig was made up of free fatty acid. After ingestion of oil 5 hr. the free fatty acid content was practically doubled. No triglycerides were present during fasting and only small amounts during the absorption period.

Vitamin A in swine feeding, W. D. ALBRIGHT and L. D. FRASER (*Canada Dept. Agr. Pub.* 736 (1942), pp. 16, figs. 10).—In five experiments on varied rations Yorkshire shotes developed staggering gaits and diverse symptoms characterized as A-avitaminosis. These symptoms were prevented and largely cured by feeding Pilchardene and green or cured alfalfa. Normal development was made for a time on the vitamin A-deficient ration and the attacks were irregular.

Vitamin A studies with rats and pigs, R. BRAUDE, A. S. FOOT, K. M. HENRY, S. K. KON, S. Y. THOMPSON, and T. H. MEAD (*Biochem. Jour.*, 35 (1941), No. 5-6, pp. 693-707, fig. 1).—Supplements of varying forms of carotene products were administered to pigs. Appreciable amounts of vitamin A were found in the livers at slaughter of pigs which had received high levels of β -carotene in the

diet. There was essentially no vitamin A in the livers of controls or pigs which had received zeaxanthin or low levels of the β -carotene. Considerable amounts of A were found when vitamin A ester or vitamin A alcohol had been fed. Similar tests with rats showed that much the same results were obtained. Zeaxanthin was biologically inactive in both species. Pigs made less efficient use of β -carotene than rats.

Factors affecting farm horse power efficiency, L. H. BLAKESLEE and R. S. HUDSON (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 25-28).—Studies of the feed requirements and selling price of draft horses sired by Percheron and Belgian stallions showed that the use of pasture and roughage offered an economical method of production and there was little difference in the selling price. In the study 28 colts were raised to 3 yr. of age on rations containing grain and hay. Groups wintered on these feeds were compared with other groups having access to a haystack and winter pasture without grain. Two colts were stall fed, which proved costly, and the individuals were more subject to deformities.

Coffee grounds in animal rations, W. KING WILSON (*Nature [London]*, 149 (1942), No. 3778, pp. 361, 362).—In one experiment of 4 mo. duration a ration in which about 10 percent of the concentrates were replaced by fresh spent coffee grounds was fed to a group of 10 adult rabbits. The average gains of the control group were 4.7 oz. during this period as compared with 3.1 oz. by the experimental group. Little difference was shown in the proportion of fertile does in the two groups.

Factors affecting profits in the poultry enterprise, C. FRISCHKNECHT (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 3, pp. 1, 11, figs. 2).—A discussion of the general principles of poultry production with special reference to the war program.

Time- and labor-saving equipment for the laying house, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta.] Spec. Cir.* 51, rev. (1942), pp. 16, figs. 16).—This is a revision with amplification of the text and illustrations of the circular previously noted (E. S. R., 80, p. 115).

The problem of moisture in poultry house litter, T. B. CHARLES, A. E. TEPPER, W. T. ACKERMAN, B. W. FRENCH, R. C. DUBGIN, and R. B. HALPIN (*New Hampshire Sta. Bul.* 338 (1942), pp. 30, figs. 11).—Observations on the moisture conditions, mortality, egg production, and related factors of poultry in 10 pens and an experimental plot house over a 3-yr. period with different kinds of litter and ventilation showed that the pen litter increased in moisture to a maximum of about 50 percent during the less favorable winter weather in February and March, with a gradual decrease in litter moisture thereafter until it again averaged about 20 percent in June. Peat moss possessed the highest moisture absorptive capacity and the greatest retention of absorbed water of any of the litters studied. The least water absorptive capacity of any of the litters studied was shown by sand and gravel. Other litters in the study included shavings, sawdust, chopped hay, sugarcane, oat hulls, and straw, separately and mixed. The moisture content of desirable poultry pen litters should not exceed 40 percent. Additions of fresh relatively dry litters to poultry pens during the winter months did not result in a continued dry litter condition. Newly added litter picked up moisture rapidly and in a few weeks reached the moisture level of old litter. Neither egg production nor mortality was related to the moisture present. It was estimated that each hen consumed approximately 22.6 gal. of water per year. Prevention of water spilling, warming floors, and insulation helped to maintain dry litters.

The hydrogen ion concentration in avian digestive tracts, D. S. FARNER. (Univ. Wis.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 445-450).—Statistical analysis of the H-ion concentration of the digestive tracts of chickens, pigeons, ducks, pheasants, and turkeys showed the gizzard to have an acidity of pH 2.00-2.60. This was significantly more acid than the duodenum and large intestine in the different species, which ranged from 5 to 7. There was a tendency for the acidity to decrease with progression from the duodenum through the ileum. The pH of the intestinal tracts was obtained by the quinhydrone electrode.

The comparison of corn, milo, and hegari in the diet of laying hens, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 410-415).—The number and interior quality of eggs produced by 19 lots of 25 laying hens each showed that either 53 percent of yellow milo or hegari were equal to equivalent amounts of white corn in a well balanced ration. Equal results were also obtained in hatchability of eggs, egg size, and live weight. In a fair diet containing no animal protein hatchability of the eggs was reduced with hegari to about 15 percent as contrasted with about 50 percent in hatchability with white corn and 40 percent with yellow milo. Neither fertility nor physical composition of the eggs was affected by the divergent dietary treatments which included rations with and without dried skim milk and alfalfa leaf meal. Eggs from pullets fed a corn and alfalfa leaf meal diet retained a high percentage of thick whites after 48 days' storage at 75° F.

Gross values of combinations of soybean oil meal with pilchard fish meal or meat meal, C. I. DRAPER and M. RHIAN. (Wash. Expt. Sta.). *U. S. Egg and Poultry Mag.*, 48 (1942), No. 8, pp. 466-468, 475-476).—When added to a cereal ration containing 8 percent protein, sufficient protein feeds to give an 11-percent protein ration gave the following results in fattening: Casein 100, pilchard fish meal 109, soybean meal 85, and meat meal 33. With as much as equal parts of pilchard fish meal and soybean meal the chicks gained well and utilized the feed as efficiently as with casein. With meat meal alone or with soybean meal the efficiency of the protein supplement was reduced.

The value of dogfish meal as a protein supplement, M. RHIAN, J. S. CARVER, R. W. HARRISON, and W. S. HAMM (*Washington Sta. Bul.* 416 (1942), pp. 24).—Employing the method of protein evaluation for chicks previously noted (E. S. R., 82, p. 377), comparison of the protein value of 18 fish meals showed dogfish meal prepared by dry rendering methods commercially and experimentally to have little value as a protein feed. On the other hand, wet process meal prepared experimentally had relatively high apparent gross protein values, comparable to those obtained with pilchard fish meal and soybean meal. There was no significant difference in dogfish meals unpreserved and preserved with 0.1-1.0 percent formaldehyde. Similar results were obtained for formaldehyde treated and untreated casein. Good care and speed of handling were essential if high quality dogfish products were to be produced. When formaldehyde was used as a coagulant there was a tendency to lower the gross protein value. The urea content of the wet process dogfish meal was not detrimental to their feeding value except as it affected the usual determination of the protein content. Unadulterated commercial dogfish meals of very high protein content, especially with large amounts of urea, were likely to be dry process meals.

Chick feeding experiments with solvent-extracted tung oil meal, L. L. RUSOFF, N. R. MEHRHOF, and R. S. MCKINNEY. (Fla. Expt. Sta. and U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 451-454, fig. 1).—No evidence of toxicity was noted from solvent-extracted tung oil meal fed as 4.9, 9.6, 14.1, and 18.5 percent of a cereal ration with alfalfa leaf meal and meat scrap to 5 lots of 9 12-day-old chicks for 5 weeks. The meal was unpalatable, resulting in reduced weekly

gains and feed consumption. As the percentage of the tung oil meal increased gains decreased.

Fat absorption in the laying hen, R. M. CONRAD and H. M. SCOTT. (Kans. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 407-409).—Differences between the fatty acid content of portal blood and heart blood of laying hens, which received an egg-yolk meal 4-7 hr. before treatment, showed that in the laying hen most of the fatty acids were absorbed by way of the portal system rather than by the lymphatic system. The study was conducted in two experiments with blood drawn from the portal vein and the heart for 15 hens in each experiment receiving fat and 4 and 6 controls.

Creatine formation in the chick, H. J. ALMQUIST, E. MECCHI, and F. H. KRATZER. (Univ. Calif.). (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 365-373).—With methods previously employed (E. S. R., 87, p. 838), the authors obtained results with chicks suggesting that glycine or arginine are specific biological precursors of creatine. In their absence the muscle creatine became very low and profound weakness developed as contrasted with the effects produced by methionine deficiency which did not reduce muscle creatine below normal.

Effect of biotin on reproduction in the domestic fowl, W. W. CRAVENS, E. E. SEBESTA, J. G. HALPIN, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 1, pp. 101-104, fig. 1).—There was a reduction from about 80 percent hatchability of eggs on normal rations to less than 20 percent in 6 weeks on a purified diet. The missing factor was supplied by additions of 5 percent whey concentrate, 3 percent kidney residue, or 15 μ g. of biotin per 100 gm. of ration. These results demonstrate clearly the need of chicks for biotin (E. S. R., 87, p. 409).

Hatching ability of poultry.—II, Texture of egg shells in relation to hatching power, E. W. HENDERSON (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 41-47).—Continuing this series (E. S. R., 86, p. 667), despite an unexpected good hatchability of one lot of eggs with porous shells from hens selected for high egg production, there was found to be a significant relation between the shell texture and the hatchability among 2,398 eggs produced by Barred Rock and White Leghorn hens. The conclusions were derived from X^2 tests and coefficients of correlation.

The effects of dubbing White Leghorn males, W. F. LAMOREUX and D. G. JONES. (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 437-444, fig. 1).—When cockerels were reared under proper conditions with access to sunlight, there were no significant differences in body weights, size of the testes and pituitaries, and production of semen or gonadotropic hormones as a result of removal of the comb and wattles. Undubbed birds with large combs showed that certain equipment such as feeders and fountains interfered with feed consumption, and that this was reflected in live weight. The study was conducted with 4 groups involving a total of 147 White Leghorn δ s with combs and wattles removed at 8-12 weeks of age from half of them, in comparison with undubbed δ s.

Rearing geese on grass alone and with supplementary feeding, M. M. WRIGHT and F. J. DUDLEY (*Harper Adams Util. Poultry Jour.*, 27 (1942), No. 7, pp. 135-137).—In studies with three lots of goslings little advantage resulted from feeding concentrates until 1 mo. before marketing. Restriction of supplementary feeding to the final 4 weeks of the feeding period tended to reduce the fat of the carcasses (E. S. R., 87, p. 841).

The development of perosis in turkey poults and its prevention, R. J. EVANS, E. I. ROBERTSON, M. RHIAN, and L. A. WILHELM. (Wash. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 422-429, figs. 2).—In a study of perosis in

turkeys, 180-day-old poults were fed in 12 groups for 8 weeks on rations supplying varying percentages of protein and minerals with perosis scores of the birds ascertained. In a second experiment 7 groups of 15 poults each were fed similar rations for 8 weeks with choline, soybean meal, pea meal, fish meal, and liver meal supplements to ascertain the effects of these materials on perosis. The general results showed that perosis in these poults was produced either by a manganese or choline deficiency. Severe perosis was effectively prevented by 0.2 percent choline or 15 percent liver meal. Some protection was afforded by 15 percent soybean meal or 13 percent herring fish meal, but 15 percent pea meal gave no benefit. The incidence of perosis was increased by increasing or decreasing the protein from 22 percent. The three symptoms of perosis indicated by Wilgus et al. (E. S. R., 78, p. 91) are described and illustrated.

DAIRY FARMING—DAIRYING

The chemical composition of Michigan-grown hays as fed to dairy cattle.—I. The carotene content, A. C. BALTZER, C. F. HUFFMAN, and C. W. DUNCAN (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 8-13).—The carotene content of 46 samples of clover, alfalfa, timothy, and other grasses mixed for first and second cutting hays per unit weight from different counties of Michigan are tabulated. These results show that there were only 5 samples among this group that contained less than 10 μ g. of carotene per gram of dry matter. The amounts of hays containing different carotene doses necessary to furnish the requirement of carotene for younger and older calves and 1,000-lb. cows were calculated. The carotene contents during the growing season were found to be high during the fast-growing period and decreasing markedly with maturity.

Limited-grain feeding and all-year pasture for dairy cows, C. E. WYLIE and L. R. NEEL (*Tennessee Sta. Cir.* 78 (1942), pp. 8, figs. 4).—In 4-yr. trials with approximately seven Jersey cows on each ration, comparison was made of 1 lb. of concentrates to 3 lb. of milk and the same amounts and kinds of concentrates to 6 lb. of milk. The results showed that the second group was pastured 346 days as contrasted with 198 days. The milk and fat production for the full-fed group were greater, but the estimated income per cow per year in the half-fed group was \$82.59 as contrasted with \$78.96 in the full-fed animals. Results of similar studies are reviewed.

Investigations to aid Mississippi dairymen (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, pp. 5, 6).—Brief results are given by C. Dorman on the relation of bitterness to flavor of cheese, on minerals, and on vitamins in feeds for dairy cows.

Dairy cattle judging, A. B. NYSTROM (*U. S. Dept. Agr., Farmers' Bul.* 1769, rev. (1942), pp. [21]+29, figs. 21).—A revision (E. S. R., 77, p. 236).

Relation of volume of daily milk production to ascorbic acid content of cow's milk, A. D. HOLMES, F. TRIPP, E. A. WOELFFER, and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Food Res.*, 7 (1942), No. 2, pp. 111-117).—The studies of the ascorbic acid content of Guernsey and Holstein milk (E. S. R., 86, p. 522) showed that the volume of the milk produced had little influence on the amount of ascorbic acid found in the milk. However, the total daily ascorbic acid production was related to the milk secreted. As lactation advanced the total output of ascorbic acid decreased.

Effect of water bacteria on quality of dairy products, W. B. SABLES. (Univ. Wis.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 7, pp. 14, 16).—Difficulties from gas-forming, proteolytic and other organisms from water may cause de-

fects, if allowed to grow, in the quality of cream, butter, and cheese. Various bacteria from water sources are identified.

Thermophilic bacteria in milk and a simple remedy against them, M. J. PAUCHA. (Univ. Ill.). (*Milk Plant Mo.*, 31 (1942), No. 4, pp. 38-39).—Thermophilic bacteria, the types which tolerate pasteurization temperatures, are discussed from the standpoint of their prevalence. Such bacteria result from a lack of cleanliness, which may be traced to the farm or the milk plant.

The problem of controlling rancidity in milk, N. P. TARASSUK. (Univ. Calif.). (*Milk Plant Mo.*, 31 (1942), No. 4, pp. 24-25).—A brief review is given of the role of lipase in milk as a factor in the development of rancidity, as reported by Krukovsky and Herrington (E. S. R., 81, p. 413).

Method of sampling an important factor in determining homogenization efficiency of milk, G. M. TROUT and M. V. SCHEID (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 16-22).—Comparison of five methods of obtaining the upper 100 cc. sample of milk homogenized at 1,000 and 2,500 lb. pressure showed that sampling with a filter pump or by decanting was more reliable than when a pipette was used. Difficulty was encountered with the cream siphon in obtaining the correct volume. Differences in the fat content of samples obtained by the different methods served as a measure of the adequacy of homogenization. Twenty-four bottles of milk were used for comparison of each of the methods of sampling.

Stability of fat emulsion in commercial homogenized milk, G. M. TROUT and M. V. SCHEID (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 22-25, fig. 1).—Homogenized milk collected from four milk plants over a 3-mo. period failed to qualify in nearly half of the 200 samples for homogenization as defined in public health standards. Quart bottles were allowed to stand 48 hr. at 40° F. before testing for differences in the fat content of the top layer and the rest of the milk.

Studies relating to soft curd milk, J. C. MARQUARDT. (N. Y. State Expt. Sta.) (*Milk Dealer*, 31 (1942), No. 8, pp. 27-28, 72).—Homogenization was shown to increase the uniformity of the curd strength and fats, solids, and ash contents of three top layers of milk as compared with normal unhomogenized samples. In all cases homogenization increased the setting time.

Developments in the pasteurization of churning cream, E. L. JACK. (Univ. Calif.). (*Jour. Milk Technol.*, 5 (1942), No. 1, pp. 44-47).—Pasteurization of churning cream at 180°-185° F. for a short period to destroy enzymatic activity as soon as possible is recommended.

Experiments in freezing cream for storage, G. M. TROUT. (Mich. Expt. Sta.). (*Canad. Dairy and Ice Cream Jour.*, 21 (1942), No. 7, pp. 22-23).—Storage of cream pasteurized and frozen at different temperatures and homogenized at contrasting pressures showed that it could be safely stored for 12 mo. if properly produced and processed without off-flavors. Storage of frozen cream seemed to offer possibilities.

Studies on surface taint butter, I-V (*Sci. Agr.*, 22 (1942), Nos. 5, pp. 277-286; 6, pp. 347-355, fig. 1; 7, pp. 438-447, pl. 1, figs. 5; 8, pp. 461-464; 9, pp. 552-560).—The results of several experiments are reported.

I. Odour production by *Pseudomonas putrefaciens*, H. Wolochow, H. R. Thornton, and E. G. Hood (pp. 277-286).—Attempts to identify the precursors of the surface taints in Alberta creamery butters in 1919 were unsuccessful, but 24-hr. growth of the organism, *P. putrefaciens*, in several culture media at room temperatures produced the characteristic odor. The cultural characteristics and odor produced by the organism at different temperatures are described.

II. An odourous compound in skim milk cultures of *Pseudomonas putrefaciens*

test, W. L. Dunkley, G. Hunter, H. R. Thornton, and E. G. Hood (pp. 347-355).—Distillation of acidified skim milk cultures of *P. putrefaciens* showed the presence of formic, acetic, butyric and isovaleric acids. The sweaty feet odor of the skim milk cultures was related chemically to these conditions.

III. *Some further characteristics of Pseudomonas putrefaciens*, H. Wolochow, H. R. Thornton, and E. G. Hood (pp. 438-447).—Cultural and morphological characteristics of *Pseudomonas* strains in different media are described.

IV. *Distribution and taxonomy of Pseudomonas putrefaciens*, H. Wolochow, H. R. Thornton, and E. G. Hood (pp. 461-464).—The isolation of *P. putrefaciens* from soil and water in Alberta is noted.

V. *The growth of Pseudomonas putrefaciens in butter*, H. Wolochow, H. R. Thornton, and E. G. Hood (pp. 552-560).—At no time in over 300 churnings was it possible to induce surface taints in butter, but it was regularly produced when the butter wash water was contaminated with this organism.

Merits of churned cultured buttermilk, C. L. ROADHOUSE. (Univ. Calif.). (*Canad. Dairy and Ice Cream Jour.*, 21 (1942), No. 8, pp. 54, 56).—A churned cultured buttermilk containing 1-2 percent milk fat did not whey off, had butter granules, was pleasing in flavor, and was produced with skim milk and cream. The skim milk and cream were pasteurized and mixed and permitted to stand before bottling.

Conditions necessary for maintaining quality of year-old vacuum-canned Cheddar cheese, N. S. GOLDING. (Wash. Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 7, pp. 10-12, figs. 2).—There are reported data on the production of a high quality vacuum-canned year-old Cheddar cheese when stored at 52° F. In contrasting studies cans were stored at 62°, 68°, and 74°, respectively. Tests were made of the pressures in the cans at 5-day intervals and the cheese scored. There seemed to be little to be gained in producing fully mature high-quality American Cheddar cheese if it were to be spoiled by high temperatures in the retail store or in the household.

Lehrbuch der Emmentalerkaserei [Textbook of Swiss cheese], A. PETER, edited by E. ZOLLIKOFER (Bern: K. J. Wyss Erben, 1942, 8. ed., pp. VIII+160, figs. 46).—General principles of cheese manufacture are presented in this eighth edition (E. S. R., 64, p. 376).

Technical literature of ice cream for 1941, A. LEIGHTON. (U. S. D. A.). (*Ice Cream Rev.*, 25 (1942), No. 9, pp. 26-28, 52, 54, 56-62).—A comprehensive review, including a classified bibliography of 261 references.

Sugars in ice cream, C. D. DAHLE. (Pa. State Col.). (*Ice Cream Rev.*, 25 (1942), No. 9, pp. 24-25, 44).—Various sweetening agents that may be used in ice cream manufacture are discussed as to their effects on the sweetness and freezing of the product.

Use of corn syrup solids in ice cream, J. W. KNECHTGES and H. H. SOMMER. (Univ. Wis.). (*Ice Cream Rev.*, 25 (1942), No. 11, pp. 22-23, 62-64, figs. 2).—Studies of the effects of different percentages of sucrose and substitutes on the freezing point and acidity of ice cream are presented. Corn sirup lowered the freezing point less than sucrose unless the replacement was made at the rate of 5 lb. corn sirup to 4 lb. sucrose. As much as 25-33½ percent of the sucrose could be replaced in ice cream mixes without interfering with the taste, body, texture, melting behavior, or whipping ability. No significant differences in consumer preference were noted when 4 percent sucrose was replaced by 5 percent corn sirup in the mix containing 16 percent sucrose.

Corn syrup solids—their use in ice cream, J. W. KNECHTGES and H. H. SOMMER. (Univ. Wis.). (*Ice Cream Trade Jour.*, 38 (1942), No. 7, pp. 14-15, 42-45, fig. 1).—Same as above.

Conserving chocolate coating, J. H. EMB. (Ohio State Univ.). (*Ice Cream Trade Jour.*, 38 (1942), No. 4, pp. 28, 63, fig. 1).—General directions for the conservation of chocolate and its use for dipping ice cream bars are given.

Substitutes for coconut fat in dipping chocolate, J. J. SCHEURING and P. H. TRACY. (Univ. Ill.). (*Ice Cream Rev.*, 25 (1942), No. 12, pp. 23, 38, 40).—A number of experiments were conducted in which part of the coconut oil in the chocolate coating of ice cream bars was replaced by domestic oils and fats, singly and in combination. These results indicated that 8–15 percent low-melting point fats and 10–25 percent high-melting point fats were used successfully as substitutes for coconut oil. The best coating was produced with a combination of 5 percent each of hydrogenated and unhydrogenated soybean oils. A satisfactory substitute coating was made from 10 percent cocoa, 40 percent powdered sugar, and 35 percent hydrogenated and 15 percent unhydrogenated soybean oil.

Reducing oiling off of frozen cream used in ice cream, J. C. HENING. (N. Y. State Expt. Sta.). (*Ice Cream Trade Jour.*, 38 (1942), No. 7, pp. 20, 48–51).—Studies of the influence of pasteurization and cooling of cream on oiling-off showed that when milk is held cold prior to separation oiling-off of the frozen material is reduced, as contrasted with cream heat treated even though the viscosity is increased. There were no significant differences in the whipping properties of such cream. In carrying out these studies samples of milk were pasteurized at 145° F. for 30 min., 150° for 20 min., 160° for 15 min., 170° for 10 min., and 180° for 5 min. Following this procedure one half was cooled to 80° and separated, but the other half was cooled to 40° and held at that temperature for 20–24 hr. Later it was warmed to 80°–85° and separated.

Stabilizers, H. H. SOMMER. (Univ. Wis.). (*Canad. Dairy and Ice Cream Jour.*, 21 (1942), No. 7, pp. 58, 60).—A brief account of stabilizers used in ice cream manufacture and how they work, together with the needs of many of these substances for war purposes.

VETERINARY MEDICINE

The relationship between nutrition and disease in farm animals, L. P. DOYLE. (Ind. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 100 (1942), No. 780, pp. 208–209).

Nature of *Elmeria nieschulzi* growth-promoting potency of feeding stuffs.—III, Pantothenic acid, E. R. BECKER and L. SMITH (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 4, pp. 443–449).—It was found in further work (E. S. R., 87, p. 270) that when a particular ration, restricted in vitamin B₁, vitamin B₂, and pantothenate, and possibly certain other accessory food factors, was employed as "basal" the addition of calcium pantothenate effected moderate increases in the numbers of oocysts eliminated during *E. nieschulzi* infections. The additional supplement with vitamin B₂ was evidenced by a still further and more marked increase in oocyst counts. The addition of vitamin B₁, or of both vitamins B₁ and B₂, to the ration already supplemented with pantothenate did not result in the marked decrease in numbers of oocysts eliminated so characteristic of the B₁+B₂ supplement to the ration lacking pantothenate supplement. Thus, pantothenate supplement counteracts the coccidium-inhibiting effect of the vitamin B₁ and B₂ supplement.

Intravenous and subcutaneous administration of alkali-treated bovine serum albumin to man and lower animals, H. A. DAVIS and A. G. EATON. (La. State Univ.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 246–248).—Alkali-treated bovine serum albumin, when administered by vein or by other parenteral routes, was found not toxic to human beings, dogs, rabbits,

guinea pigs, or mice and to possess little or no antigenicity. It was shown to be capable of raising and maintaining the blood pressure of dogs subjected to severe hemorrhage. It is pointed out that these findings suggest that alkali-treated bovine serum albumin may prove useful as a substitute for blood in man.

Clinical findings in encephalitis (western equine), J. D. ADAMSON and S. DUBO (*Canad. Pub. Health Jour.*, 33 (1942), No. 6, pp. 288-300, figs. 4).

The pathology of western equine encephalomyelitis: 18 human cases, Manitoba epidemic, 1941, T. L. QUONG (*Canad. Pub. Health Jour.*, 33 (1942), No. 6, pp. 300-306, figs. 8).

Western equine encephalomyelitis in infants, H. MEDOVY (*Canad. Pub. Health Jour.*, 33 (1942), No. 6, pp. 307-312, fig. 1).

Swine erysipelas infection in man, L. VAN ES (*Nebraska Sta. Res. Bul.* 130 (1942), pp. 34, figs. 5).—This contribution, which supplements the author's report of investigations of swine erysipelas in pigs (*E. S. R.*, 88, p. 103), reviews the present knowledge of it as a human disease (erysipeloid), describing its more salient features, and examining them from epidemiological, clinical, pathological, and prophylactic viewpoints. Within the past decade it has spread throughout Nebraska's swine population and become a major problem of preventive medicine. A list of 115 references to the literature is included.

The affinity of Newcastle disease virus to the influenza virus group, F. M. BURNET (*Austral. Jour. Expt. Biol. and Med. Sci.*, 20 (1942), No. 2, pp. 81-88).—Report is made of the activity of the virus of Newcastle disease of fowl after inoculation by various routes in the chick embryo. In nearly every respect there is a striking resemblance to the behavior of well-adapted strains of influenza virus. Infected amniotic or allantoic fluids agglutinate red cells from several species; the reaction closely resembles the Hirst phenomenon with influenza virus and is specifically neutralized by immune serum. There is no serological relation between Newcastle disease virus and influenza viruses. After intranasal inoculation in mice Newcastle disease virus produces influenza-like consolidation of the lungs, sometimes fatal. Ferrets show no temperature response after administration of high titer Newcastle disease virus, but may develop a significant antibody response.

Rickettsia-like organism from normal Dermacentor andersoni Stiles, E. A. STEINHAUS (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 37, pp. 1375-1377).—Under the name *Rickettsia dermatrophila* an organism occurring spontaneously in the tissues of the tick *D. andersoni* is described as new. It cannot be cultivated on various artificial media, but is readily maintained by serial passage in incubating fertile chick eggs. The egg fluids, which constantly contain large numbers of organisms, were used as the transfer medium. It is nonpathogenic for laboratory animals and various rodent hosts of *D. andersoni*, and inoculated animals are not subsequently immune to Rocky Mountain spotted fever or American "Q" fever.

Studies on staphylococcal toxins, L. W. SLANETZ. (N. H. Expt. Sta.). (*Jour. Bact.*, 43 (1942), No. 1, pp. 105-106).

On the isolation and growth of a bacteria-free strain of Trichomonas fetus in Minnesota, M. D. SCHNEIDER. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 787, pp. 245-247).—A bacteria-free strain of *T. fetus* was isolated in Minnesota through the use of a thermostable semisolid medium and a Glaser-Coria "V" tube. It is recommended that for bacteria-free isolation the material be taken from a direct vaginal wash of an infected cow, immediately washing the trichomonads by centrifugation and concentrating them to a small volume of 1 to 2 cc. of liquid medium. The washing seems to increase the motility of the trichomonads, thereby making the chance of isolation more

likely. Comparative microscopic examinations of vaginal wash material showed that in washing the sample thus taken by centrifugation and concentrating to a small volume one is more apt to be positive of the diagnosis. An eggshell modification was introduced for routine use in the sodium citrate and sodium carbonate mediums. Suggestions are made for preventing evaporation of the liquid parts of the medium when cultures are to be incubated for periods longer than 1 mo. *T. foetus* grows well under partially anaerobic conditions.

Studies pertaining to the antibacterial activity of sulfathiazole and its methyl derivative, R. D. MUIR, V. J. SHAMLEFFER, and L. R. JONES (*Jour. Bact.*, 44 (1942), No. 1, pp. 95-110, figs. 2).—Sulfathiazole and sulfamethylthiazole have been found to display practically identical bacteriostatic activities in vivo and in vitro under the conditions obtaining in the experiments reported. "The antibacterial activity of the thiazole drugs is significantly greater in the synthetic medium herein employed than in an ordinary nutrient broth. Viable cell counts made from cultures in synthetic media containing sulfathiazole reveal an initial lag phase in drug activity which is followed by a prolonged period of bacteriostasis. Similar cell counts made from nutrient broth cultures likewise exhibit an initial lag phase in drug action followed by a period of increase, logarithmic in character but reduced in tempo. Para-aminobenzoic acid and a few closely related compounds as well as a variety of bacteriological peptones and other commonly used ingredients of ordinary culture media were found to possess antisulfathiazole activity when tested under standardized conditions."

Synthetic phenol disinfectants, J. VARLEY (*Soap and Sanit. Chem.*, 18 (1942), No. 6, pp. 109-112).—It is shown from the results of intraperitoneal injection of a 1 : 10 aqueous dilution of disinfectants including liquor cresolis compositus, 50 percent cresylic disinfectant, and two newly developed types of synthetic phenol (coefficient 5) germicides that the first two mentioned are definitely more irritating to the skin of rabbits than the two types of synthetic phenol germicides. One of the synthetic phenol germicides appears to be the best material and the one most unlikely to cause dermatitis.

Evaluation of germicidal properties of sodium hydroxide and alkaline washing compounds, C. R. ARNOLD and M. LEVINE (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 4, pp. 519-538, figs. 4).

Special report on diseases of cattle (*U. S. Dept. Agr., Bur. Anim. Indus.*, 1942, rev. ed., pp. VII+507, pls. 50, figs. 24).—A new edition of this work (E. S. R., 51, p. 84) in which many of the parts have been revised by new contributors.

Some common diseases of cattle, G. H. CONN (*New York: Orange Judd Pub. Co.*, 1942, pp. 176, [figs. 36]).

Lesions of the Purkinje network of the bovine heart as a result of potassium deficiency, J. F. SYKES and L. A. MOORE. (*Mich. Expt. Sta.*). (*Arch. Pathol.*, 33 (1942), No. 4, pp. 467-471, figs. 3).—It was shown that rations low in potassium when fed to calves produced degenerative changes in the Purkinje fibers of the heart. These changes were accompanied by alterations in the electrocardiograms of the animals. The Purkinje fibers presented in varying degree a granular appearance. Vacuolation of the fibers was also observed in some instances.

Chronic bloat associated with a papilloma of the reticulum, A. F. SELLERS. (*Minn. Expt. Sta.*). (*Cornell Vet.*, 32 (1942), No. 3, pp. 321-325, figs. 2).—Report is made of the findings in a 2- to 2.5-year-old Holstein female that had suffered from an attack of coccidiosis with concomitant diarrhea from 6 mo. of age.

Arteriosclerosis in a clinical case of bovine Johne's disease, R. GIFFORD, D. F. EVELETH, and W. GIFFORD. (*Ark. Expt. Sta.*). (*Vet. Med.*, 37 (1942), No. 10, pp. 416-420, figs. 8).—Report is made of a case of advanced arteriosclerosis in

a 3-year-old Hereford cow. The possible relationships of Johne's disease and other factors as predisposing influences are considered.

Treatment of infectious keratitis in cattle, M. W. EMMEL (Univ. Fla.). (*North Amer. Vet.*, 23 (1942), No. 3, p. 204).

Intramammary injection of homogenized oil-sulfanilamide in the treatment of bovine mastitis, J. C. KAKAVAS (Univ. Del.). (*Jour. Bact.*, 44 (1942), No. 2, pp. 262-263).—It was found in the treatment of bovine mastitis that sulfanilamide could be introduced into the udder of a cow very readily by properly suspending the drug in light liquid petrolatum. One lb. of sulfanilamide is added to 900 cc. of light liquid petrolatum and mixed thoroughly by means of a mechanical mixer. The mixture is then passed through a homogenizer, resulting in a thin uniform creamy suspension which remains stable. One cc. of the homogenized oil-sulfanilamide contains 0.378 gm. of sulfanilamide. In streptococcal mastitis the dosage recommended for an average size udder is 40 cc. of the homogenized product given daily for 4 days. If the infection persists the treatment may be repeated with safety. In staphylococcal mastitis the dose recommended is 80 cc. of the product given daily for 4 days and repeated if indicated. The homogenized oil-sulfanilamide as used in these experiments was well tolerated and no contraindications have been manifested in the cases treated. There was no appreciable decrease in milk production during or after treatment. When 103 cows, 100 infected with *Streptococcus agalactiae* and 3 with *S. uberis*, were treated for streptococcal mastitis by intramammary injections with homogenized oil-sulfanilamide, the bacteriological findings indicated cures were effected in 92 cows and partial or no improvement in 11. Of the 265 quarters treated, 251 were cured and 14 were not.

The role of gramicidin in bovine mastitis therapy, W. J. MULCHINOCK (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 4, pp. 95-101).—Following a brief review of the literature, the details of three experiments are reported. They show gramicidin to be an effective agent in the treatment of bovine mastitis caused by *Streptococcus agalactiae*.

Studies in the epidemiology of Q fever.—IX, The role of the cow in the transmission of human infection, E. H. DERRECK, D. J. W. SMITH, and H. E. BROWN (*Austral. Jour. Expt. Biol. and Med. Sci.*, 20 (1942), No. 2, pp. 105-110, fig. 1).—In this further contribution (E. S. R., 87, p. 111) it is shown that cattle are susceptible to Q fever, and in the endemic area natural infection occurs among them. It is probable that the cows become infected from the animal reservoir by means of ticks (other than *Boophilus annulatus microplus* Can.), and that they can then transmit the infection to humans either directly from their tissues or indirectly from the crushed tissues or feces of their ticks.

Experiments on the transmission of rinderpest through the agency of *Tabanus orientis*, with remarks on the feeding habits of this fly, H. R. KAPUR (*Indian Jour. Vet. Sci. and Anim. Husb.*, 11 (1941), No. 2, pp. 84-93, figs. 2).—Of two healthy bulls that were subjected to bites of wild *T. orientis* flies partially fed on rinderpest-infected animals, one developed typical symptoms of the disease, which eventually progressed to a fatal issue. Observations on the feeding habits of *T. orientis* have shown that the fly seldom takes more than one complete feed in captivity but that under field conditions it usually continues to feed until it is fully engorged. These facts make it impossible for this fly to play any important role in the spread of rinderpest. The virus of rinderpest is viable in the body of the fly for a minimum period of 30 hr. and inert at 48 hr.

Clinical observations in bovine trichomoniasis, A. T. and R. GILYARD (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 787, pp. 276-278).

Experimental infestation with *Fischoederius elongatus* in a calf at Madras. S. N. VAIDYANATHAN (*Indian Jour. Vet. Sci. and Anim. Husband.*, 11 (1941), No. 3, p. 243).

Lungworms of domestic sheep and bighorn sheep in Wyoming. R. F. HONESS (*Wyoming Sta. Bul.* 255 (1942), pp. 24, figs. 27).—In the investigation conducted two species of lungworms were found infesting bighorn sheep in Wyoming, namely, *Protostrongylus rushi* Dikmans 1937 and *P. frosti* n. sp. Of these, *P. frosti* was the more serious, its damage to lung tissue, while not dependent completely upon a nutritional-bacterial complex, being irreparable. No special pathology was observed for *P. rushi*. It is pointed out that *Dictyocaulus filaria* is the only lungworm known to infest domestic sheep in Wyoming.

Observations on *Babesia foliata* n. sp. from a sheep. H. N. RAY and K. RAGHAVACHARI (*Indian Jour. Vet. Sci. and Anim. Husband.*, 11 (1941), No. 3, pp. 239-242, pl. 1).

Phenothiazine as an anthelmintic for sheep. V. E. WHITEHURST, JR., and L. E. SWANSON. (Fla. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 256-259).—The experiments reported led to the conclusion that phenothiazine may be effectively administered to sheep grazed on grain crops. Doses of 25 gm. per adult sheep, given at monthly intervals, were effective in controlling stomach worms in sheep. The drug was not toxic or objectionable when given with feed. No serious staining of the wool was observed from the use of phenothiazine.

The foot-worm disease in deer of the northern Rocky Mountain region. R. M. DeNio and R. M. WEST. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 7, pp. 540-543, figs. 2).—Report is made of the recent discovery of an important disease of deer and elk in the northern Rocky Mountain region. This disease is known to occur mainly in western Montana but may have a far wider distribution. Frequently diagnosed erroneously as foot rot due to *Actinomyces necrophorus*, it was found by W. M. Rush in 1933 to be caused by the footworm parasite *Onchocerca cervipedis*, previously classified as *O. flexuosa*. The affection is confined almost entirely to whitetail and mule deer; 19 percent of 424 deer examined were infected. The highest rate of occurrence is in adult animals, and 69 percent of the infected adults were males. The life history of this organism has not been studied and its mode of transmission is unknown, consequently control measures have not yet been attempted.

Photosensitization produced in pigs by phenothiazine. W. E. SWALES, W. D. ALBRIGHT, L. FRASER, and G. W. MUIR (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 6, pp. 169-172).—The data presented show that phenothiazine may induce photosensitization and other toxic reactions in pigs. It is suggested that pigs treated with this chemical should be protected from direct sunlight for at least 3 days afterward. Pigs less than 70 days of age should not be treated with phenothiazine.

Cell changes in gall bladder as an aid in the diagnosis of hog cholera. W. H. BOYNTON, G. M. WOODS, F. W. WOOD, and N. H. CASSELLBERRY. (Univ. Calif. et al.). (*Vet. Med.*, 37 (1942), No. 7, pp. 288-290, figs. 2).—A study conducted with a view to expediting the diagnosis of hog cholera resulted in the finding that the nuclei of both the glandular and epithelial cells of the gall bladder stained very sharply and distinctively, inclusion bodies being observed in the nuclei of many of the glandular cells. These bodies stained a deep magenta and were easily differentiated from the nucleoli, which stained a light blue. In all the non-cholera cases the glandular and epithelial cells failed to take the stain readily. Thus, a manifestly different and easily discernible microscopic picture can be obtained from the gall bladder scrapings of cholera-infected pigs.

Crystal violet vaccine for the prevention of swine fever, T. M. DOYLE (*Vet. Jour.*, 98 (1942), No. 3-4, pp. 51-64).—The author has found that the immunity conferred by crystal violet vaccine for the prevention of hog cholera is complete by about the twelfth day and persists under laboratory conditions for at least 10 mo. Vaccinated pigs did not transmit the infection to in-contact pigs. Repeated lots of vaccine of a reasonably uniform potency were prepared.

Sulfaguanidine in the treatment of infectious enteritis in swine, H. C. H. KERKAMP and M. H. ROEPKE (Univ. Minn.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 268-269).—The treatment with sulfaguanidine of 133 swine affected with infectious enteritis in both the acute and chronic form generally checked the diarrhea, with the feces returning to normal consistency by the fourth or fifth day. About 92 percent of the animals recovered, 7.5 succumbed, and 0.75 percent made no improvement. This preliminary work suggests that an effective dose lies within the range of 0.165 to 0.33 gm. per kilogram of body weight (7.5 to 15 gm. per 100 lb.). In preliminary toxicity trials no evidence of ill effects was noted with dosages below 0.66 gm. per kilogram of body weight. The daily dose was divided between morning and evening and administered in capsules or mixed with small amounts of feed. The treatment was continued for 3 or 4 days after the condition became normal.

A new Salmonella type, J. J. MONTEVERDE (*Nature* [London], 149 (1942), No. 3782, p. 472).—The name *S. donariensis* is suggested for a new *Salmonella* type isolated by the author in Buenos Aires from the mesenteric gland of a normal pig. Its characteristics are described.

The use of Brucella abortus vaccine in fistulous conditions in horses, H. SUMNER (*Vet. Rec.*, 54 (1942), No. 26, pp. 257-258).—Reference is made to the successful use of Nator B dead *B. abortus* vaccine in 4 cases of poll evil and 6 cases of fistulous withers without any other treatment or untoward results of any kind. All but 2 of 15 succeeding cases of quittor, including 10 reactors to the agglutination test for *B. abortus*, when treated with a dead vaccine made a complete recovery. Agglutinins were present in 2 cases in a dilution of 1:10 only, 3 cases in 1:20, 4 in 1:40, and 1 in 1:80. The vaccine is given subcutaneously and the dose repeated every 5 to 8 days until recovery takes place. The period of treatment with vaccine averaged 6 weeks. No local medication was applied. No constitutional reaction has been observed when the dead vaccine is employed.

The relationship of St. Louis encephalitis virus to the equine encephalitis problem, with notes on results of inoculation of horses with St. Louis encephalitis virus, M. S. SHAHAN, L. O. MOTT, R. L. KNUDSON, O. L. OSTEN, and L. T. GILTNER (U. S. D. A.). (*Vet. Med.*, 37 (1942), No. 8, pp. 339-345, figs. 2).—This contribution, presented with a list of 19 references to the literature cited, reports upon intracerebral inoculations of 14 horses with St. Louis encephalitis virus. Eight horses that recovered from inoculation with St. Louis encephalitis virus were found to be immune on reinoculation. Three horses which recovered from St. Louis encephalitis virus were susceptible to intracerebral inoculation of western equine encephalomyelitis. The St. Louis virus did not appear in the blood in amounts demonstrable by mouse inoculation following the intracerebral inoculation of the horses. Differences in the symptoms observed in horses inoculated with St. Louis encephalitis and western equine encephalomyelitis viruses are pointed out. The results of a limited number of in vitro neutralization tests of blood serum collected from horses injected with St. Louis encephalitis virus are given.

The anthelmintic activity of Ficin in dogs, T. J. BROOKS, JR., and H. W. BROWN (Univ. N. C. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 787, pp. 250-253).—In a series of eight dogs the enzyme "Ficin," obtained from

the latex of *Ficus doliaria* grown in Brazil, was found to be 100-percent effective in removing *Ascaris* spp. from the intestinal tract. It was 96-percent effective against *Trichuris dispar*, 13.6 percent effective against *Ancylostoma caninum*, and totally ineffective against *Dipylidium caninum*. It also appeared to have no effect on the microfilariae of *Dirofilaria immitis*, or on *Diectophyme renale*, either in the kidney or in the body cavity.

Distemper studies in ferrets, II-V (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), Nos. 6, pp. 176-181; 7, pp. 204-207; 8, pp. 234-238; 9, pp. 262-267).—Four further contributions are reported (E. S. R., 87, p. 571).

II. *Tissue vaccines prepared from viscerotropic distemper virus*, E. A. Watson and L. M. Heath (pp. 176-181).—A vaccine prepared from composite formalized ferret tissues, exclusive of spleen, indicated higher immunizing properties than a vaccine prepared from spleen tissue alone. Vaccines prepared from various formalized ferret tissues indicate immunizing properties in all tissues tested except heart and brain. The immunizing values of the various tissue vaccines were in the following order: Trachea-lung and kidney, gall-urinary bladders and stomach, and liver and spleen. Heart and brain tissues were worthless as vaccines. Vaccinated ferrets were more susceptible to infection by contact exposure than by the subcutaneous inoculation of virus.

III. *Tissue vaccines prepared from neurotropic distemper virus*, L. M. Heath and E. A. Watson (pp. 204-207).—It was found that formalized tissue suspensions composed of either brain tissue alone or composite tissues from ferrets manifesting symptoms of distemper protected ferrets against homologous or heterologous strains of virus when inoculated subcutaneously. The formalized brain suspension, however, gave no protection against homologous virus in brain suspension inoculated intracerebrally, while the formalized composite tissue gave 50 percent protection against similar infection. No evidence was found to indicate that the immunizing properties of tissue vaccines were correlated with the presence of inclusion bodies in the tissue from which vaccines were prepared.

IV. *Protective, therapeutic, and aggressin properties of composite tissue vaccine*, E. A. Watson and L. M. Heath (pp. 234-238).—The authors found that the minimum period required to establish immunity with the tissue vaccine employed against subcutaneous infection was 5 days, while a period of 8 days was necessary when infection was by contact. The tissue vaccine employed indicated no therapeutic action on the course of the disease after infection by either the subcutaneous inoculation of virus or by contact. The experiment furnished no evidence that the vaccine contained aggressin properties.

V. *Immunizing and therapeutic properties of anti-distemper serum*, L. M. Heath, E. A. Watson, and P. J. G. Plummer (pp. 262-267).—It was apparent that passive immunity against contact exposure was of short and varied duration, the length of which was apparently dependent on the interval between serum treatment and exposure. The shorter the interval, the longer was the immunity. Active immunity was established when antiserum was administered simultaneously and as late as 3 days after the subcutaneous inoculation of virus. This type of immunity was, however, less evident when ferrets were exposed to infection by contact before serum treatment. There are no curative properties in the antiserum when administered in a single dose after the appearance of visible symptoms.

Histologic adaptation of the fox encephalitis virus, R. G. GREEN and J. C. BARTON. (Univ. Minn.). (*Jour. Bact.*, 44 (1942), No. 2, p. 253).—The finding of the distribution of inclusion bodies indicates that the fox encephalitis virus is adapted primarily to growth in vascular endothelium and grows secondarily in pia-arachnoidal cells and hepatic cells. This virus does not seem adapted

to invasion of nerve cells. The symptoms of encephalitis appear to be caused by destruction of the cerebral vascular endothelium.

The pathology of Chastek paralysis in foxes, a counterpart of Wernicke's hemorrhagic polioencephalitis of man, C. A. EVANS, W. E. CARLSON, and R. G. GREEN. (Univ. Minn. et al.). (*Amer. Jour. Pathol.*, 18 (1942), No. 1, pp. 79-91, pl. 1).—This contribution is presented with a list of 14 references to the literature.

Two larval cestodes from the muskrat, D. J. AMEEL. (Kans. State Col. et al.). (*Amer. Micros. Soc. Trans.*, 61 (1942), No. 3, pp. 267-271, figs. 7).—A list is given of the helminth parasites, including percentages of infection per species, that were found on examination of 252 muskrats taken during the trapping seasons of 1928 and 1929 largely from southern and central Michigan. This is followed by descriptions of two unidentified larval cestodes.

Woolly-pod or broad-leaved milkweed (*Asclepias eriocarpa*) poisoning of rabbits, E. L. VAIL (*North Amer. Vet.*, 23 (1942), No. 8, pp. 539-542).—The woollypod or broad-leaved milkweed here considered, which grows in many sections of California and in abundance in southern California, proved to be poisonous to domestic and western cottontail rabbits. The leaves and stems, fresh or air-dried, and the latex of this plant are all poisonous to the rabbit. The most marked symptoms are progressive anterior and, to a lesser degree, posterior paralysis. The rabbits at first assume a "humped" position, later become prostrate and comatose. Following coma, death occurs within a few hours. The autopsies reveal congested blood vessels and a hemorrhagic condition in practically all vital organs. Rabbits seldom eat the plant except when it is mixed with hay or straw. The air-dried plants lose much of their objectionable odor and taste, thus becoming more palatable to domestic rabbits unaccustomed to fresh, green feed.

Observations of mortality during the course of poultry breeding operations in Canada, S. S. MUNRO (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 787, pp. 256-259, figs. 2).

Coccidiosis in chickens, C. A. HERRICK and J. G. HALPIN (*Wisconsin Sta. Spec. Bul.*, rev. 1942, June, pp. 2).—A mimeographed revision of the practical account noted (E. S. R., 77, p. 546).

The periodicity of oocyst discharge in coccidial infection of chickens, P. P. LEVINE (*Jour. Parasitol.*, 28 (1942), No. 4, pp. 346-348, fig. 1).

Preservation of avian malaria parasites by low-temperature freezing, R. D. MANWELL and G. JEFFERY (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 222-224).—Report is made of the successful preservation of seven species of avian malaria plasmodia for periods up to 90 days by low-temperature freezing. Very rapid freezing and thawing seem of more importance than the occurrence of fairly considerable temperature variations. For maintaining stocks of malaria for research or class use this method of preservation has much potential importance. It is probable that all species of plasmodia can be preserved in this way equally well, and it does not appear that different stages of the parasite are much differently affected.

Chemotherapy and avian malaria, A. BISHOP (*Parasitology*, 34 (1942), No. 1, pp. 1-54).—This summary of knowledge of the subject is presented with a nine-page list of references to the literature cited.

Pullet disease: A cholera-like disease of poultry, J. F. RYFF and H. J. STAFSETH. (Mich. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 7, pp. 294-296, figs. 2; *also in Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, p. 71).—A practical account of the cholera-like disease of young chickens and turkeys, reported upon by Jungherr and his associates at the Connecticut Storrs Experiment Station (E. S. R., 86, p. 96), which may in its various manifestations resemble botulism,

leucosis, fowl typhoid, and other bacterial affections. Work by the authors with *Escherichia coli* indicates that colon organisms are merely secondary invaders and not the cause of pullet disease.

Pullorum like infection of fowl, A. R. YOUNIE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 6, pp. 172-173).—A further report is made of the affection of fowls indistinguishable in history and symptoms from pullorum disease previously noted (E. S. R., 85, p. 827).

Twenty-second annual report of pullorum disease eradication in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul.* 112 (1942), pp. 11).—In further eradication work with pullorum disease (E. S. R., 86, p. 391), during the 1941-42 testing season 667,824 samples (662,715 chickens and 5,109 fowl other than chicken) were tested. In 366 chicken flocks, 653,080 birds were tested and of these 591,628 were in nonreacting flocks. The percentage of positive tests was 0.27. No reactors were detected among tested birds in 5 of 13 counties. The marked increase (99,153) over the previous season in the number of birds in nonreacting flocks reveals further progress in the establishment and maintenance of pullorum-free flocks.

A preliminary report on a method of vaccination against Ranikhet disease [of poultry], J. R. HADDOW and J. A. IDNANI (*Indian Jour. Vet. Sci. and Anim. Husband.*, 11 (1941), No. 2, pp. 113-121).

Certain nutritional requirements of the fowl cestode *Raillietina cesticillus* (Molin) as demonstrated by short periods of starvation of the host, W. M. REID. (Kans. Expt. Sta. et al.). (*Jour. Parasitol.*, 28 (1942), No. 4, pp. 319-340, figs. 2).—Observations upon short starvation periods of chickens infected with *R. cesticillus* (E. S. R., 86, p. 383) having led to the conclusion that profound changes must be induced in these parasites by lack of proper food in the gut of the host, a more comprehensive study was made by using the combination of starvation and chemical analyses of worms removed from starved and control hosts. It was found that 20 hr. of host starvation is sufficient to reduce the glycogen content of *R. cesticillus* to about one-eleventh of its normal level. "This reduction in the glycogen store is believed to be responsible for the loss of strobilae in starvation because insufficient muscular energy is available to counteract the action of peristalsis. A daily fluctuation occurred in the glycogen level of tapeworms in the gut of chickens under normal feeding habits from 7.14 percent at 6 p. m. to 3.68 percent at 6 a. m. It is thought that this fluctuation, which is dependent upon the presence of available food material in the host gut, explains the release of proglottids only at certain hours during the day. These findings afford proof of the importance of glycogen in the metabolism of cestodes. The mean percentage composition of *R. cesticillus* removed from the fowl under normal feeding conditions at 6 p. m. was found to be 79.46 percent water, 6.51 percent glycogen, 3.2 percent ether-soluble extract, 1.14 percent nitrogen, and 2.36 percent ash content. Compared with other work, the percentage of water is considerably lower than that in the other forms which have been completely analyzed, with correspondingly high glycogen, nitrogen, and ash values for this worm.

"Crowding of *R. cesticillus* in heavy infections causes a dwarfing in the size [of] the cestodes as measured by weight. The diminished carbohydrate level in the host intestine due to food consumed by the worm does not appear to be sufficient to produce this effect. Proglottid counts supplemented with rather complete infection data are of value in estimating the number of worms in a living fowl—information of value in anthelmintic and certain other experimental fields."

A two-page bibliography is included.

" Field experiments in the use of sulfur to control lice, fleas, and mites of chickens, M. W. EMMEL (*Florida Sta. Bul.* 374 (1942), pp. 8, fig. 1).—In reporting further (*E. S. R.*, 77, p. 858) the author presents the results of a series of field experiments aimed at determining the value of sulfur in the control of ecto-parasites of the fowl. Chicken lice (the large and small body louse, shaft louse, and fluff louse) were completely eradicated from 10 farm flocks by feeding 5 percent of dusting sulfur in the regular mash for a period of 3 weeks and scattering sulfur over the soil in the yards at the rate of 2 lb. per 100 sq. ft. Sticktight fleas were completely controlled by a similar procedure in 8 farm flocks. Combined infestations of lice and fleas were controlled successfully on 7 farms by the same procedure. Sulfur getting onto external parts of the birds appears to be the important factor in this means of control. The common chicken mite was controlled successfully on 8 farms by dusting sulfur about the house and on the litter, dropping boards, and nesting material.

The efficacy of phenothiazine for the removal of the cecal worm of chickens, R. W. ALLEN, L. OLIVIER, and H. O. PETERSON. (*U. S. D. A.*). (*Vet. Med.*, 37 (1942), No. 10, pp. 412-415, figs. 5).—In the experimental work reported, details of which appear in table form, phenothiazine administered for 4 consecutive days at daily dose rates of 0.05, 0.1, and 0.5 gm. removed 12.6, 91.7, and 99.8 percent, respectively, of the mature or nearly mature *Heterakis gallinae* from naturally infected chickens. Of the three dosages tested, 0.5 gm. was the most effective. The drug has no significant lethal effect on the unexpelled worms, and on the basis of the weight data there was no evidence to indicate that it affected the chickens adversely.

Some effects of feeding phenothiazine to chickens in various amounts, L. G. NICHOLSON and E. C. McCULLOCH. (*Wash. Expt. Sta.*). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 786, pp. 205-209, figs. 7).—In experimental work the prolonged medication of hens over a period of 85 consecutive days with 1 gm. per day of phenothiazine, which is twice the maximum recommended single therapeutic dose, exerted a deleterious effect upon body weight, egg production, and hemoglobin concentration, and perhaps mortality of the hens. Four of the six hens receiving this amount of phenothiazine, which averaged approximately 0.505 gm. per kilogram per day for 85 days, or a total of 42.8 gm. per kilogram, survived. When six hens were given 0.5 gm. per day, which is the maximum recommended single therapeutic dose, for 85 consecutive days no significant effect was observed upon body weight, egg production, or hemoglobin concentration, and all survived. The feeding of mash containing 2,000 gm. of phenothiazine per ton for 61 days had no deleterious effect upon body weight, egg production, or hemoglobin concentration.

Phenothiazine vs. hemoglobin in chickens, B. MERIWEATHER (*Vet. Med.*, 36 (1941), No. 7, pp. 374-375, fig. 1).—In determining the toxic effect of phenothiazine upon the blood of fowl, a fine-powdered commercial form was administered to four groups of nine birds each, members of the first group receiving 0.5 gm. each, the second 1 gm., the third 2.5 gm., and the fourth 5 gm. The hemoglobin average was determined for each group of birds, using a Dare's hemoglobinometer in all the determinations, the readings on each bird being made at intervals of 24, 48, 72, and 96 hr. after dosing. A drop in the hemoglobin content amounting to approximately 2 gm. per 100 cc. of blood resulted, the decrease being most noticeable 48 hr. after administration, after which a gradual rise in hemoglobin occurred. The decrease in hemoglobin of birds receiving 10 times the therapeutic dose did not differ materially from that in birds receiving the normal dose, possibly due to the fact that a large part of the drug was eliminated unchanged in the feces when large doses were adminis-

tered. It is pointed out that while the anemia is of considerable duration in the Equidae it is evanescent or of no consequence in the fowl.

Cochlosoma rostratum from the turkey, E. McNEIL and W. R. HINSHAW. (Univ. Calif.). (*Jour. Parasitol.*, 28 (1942), No. 4, pp. 349-350).

Two new Salmonella types with related specific antigens, P. R. EDWARDS and D. W. BRUNER. (Ky. Expt. Sta.). (*Jour. Immunol.*, 44 (1942), No. 4, pp. 319-324).—The first of two new species, isolated from the liver of one of a group of poults affected with a fatal disease and represented by the antigenic formula (VIII):1, (v) . . . -1, 6 . . . , is described under the name *S. amherstiana*. The second, isolated from a child affected with gastroenteritis and from normal human carriers and represented by the antigenic formula [I], IX, XII . . . :1, z . . . -1, 5 . . . , is described under the name *S. javiana*. Attention is called to the complexity of the phases containing antigen 1.

Heterakis isolonche Linstow (1906) in a pheasant, with remarks on tuberculosis and gapeworms, F. R. BEAUDETTE. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 787, pp. 274-275).—Report is made of the finding of *H. isolonche* in an emaciated golden pheasant found dead on a farm near New Brunswick, N. J. This nematode is the cause of nodular or verrucose typhilitis of pheasants.

Reducing coccidiosis in California valley quail during captivity, C. M. HERMAN and J. JANKIEWICZ (*Calif. Fish and Game*, 28 (1942), No. 3, pp. 148-149, fig. 1).—Fifteen California valley quail (*Lophortyx californica*) infected heavily with coccidia (*Eimeria* spp.) at the beginning of the experiment were kept in elevated wire-bottomed cages. Daily examinations showed a gradual reduction, and by the end of 1 week very few oocysts could be found in the material from any of these birds, indicating that the larger number of parasites more likely to injure the health of the birds is maintained only with continual reinfection.

The protozoan blood parasite Haemoproteus lophortyx O'Roke in quail at the San Joaquin Experimental Range, California, C. M. HERMAN and B. GLADING (*Calif. Fish and Game*, 28 (1942), No. 3, pp. 150-153, figs. 3).—Data are presented upon a survey of blood smears from valley quail in the San Joaquin Experimental Range from September 1937 to September 1940. *H. lophortyx* infection was found in 84.3 percent of the 503 quail examined. Intensity of infection has been tabulated by the number of parasites present per 10,000 red blood cells. A greater percentage of infection was noted in birds under 1 yr. of age than in adults during all months of examination except in August and September, when the reverse was true.

Occurrence of psittacosis-like infection in domestic and game birds of Michigan, B. EDDIE and T. FRANCIS, JR. (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 291-295).—Complement-fixation tests with the virus of meningo-pneumonitis in Michigan revealed that 61 of 100 pigeons reacted with the antigen, 41 of them in dilutions of 1:32 or greater. Pigeon serum fails to give the cross-reaction with lymphogranuloma venereum antigen which is commonly seen with human serum. Reactions of variable intensity were obtained with 22 of 100 serums from domestic turkeys, with 5 of 24 serums from domestic ducks, and, in the lowest dilution only, with 9 of 45 chicken serums. No reactions were observed with the serums of 90 wild fowl.

AGRICULTURAL ENGINEERING

Recent findings in agricultural engineering, R. W. TRULLINGER. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 6, pp. 181-185, fig. 1).—This is a review of the agricultural engineering work of the State experiment stations in 1941.

Under the heading of machinery and power are taken up better use of tractors and power equipment, more efficient tillage methods and equipment, better mechanical planting and fertilization of field crops, mechanical harvesting, weed-control equipment, spraying and fumigating equipment, and orchard heaters. The topic erosion and runoff control methods and equipment covers much of the work of the State stations in cooperation with the U. S. D. A. Soil Conservation Service. The discussion of rural electrification deals with farm freezing units, electric pig and lamb brooders, electricity in dairy farming, and electric fencing. Under the head of farm structures are included better farm homes, poultry-production structures, and crop storages.

Engineering contribution to war program in agriculture, H. L. BROWN (*Agr. Engin.*, 23 (1942), No. 7, p. 231).—This is a brief general discussion noting the place of soil conservation measures, increased use of electricity, and farm machinery in the expanding food production program.

Improving efficiency of farm labor to meet wartime demands, E. W. LEHMANN and H. P. BATEMAN. (Univ. Ill.). (*Agr. Engin.*, 23 (1942), No. 9, pp. 277–280, figs. 2).—Some of the topics taken up are training of operators and repairmen, extending the use of machines, improving tractor efficiency and economy, an engineering approach to selection and effective use of power and machinery units, an accident and fire prevention program, and plans to carry out the program.

Agricultural engineering in India, M. VAUGH and M. D. STRONG (*Agr. Engin.*, 23 (1942), No. 7, pp. 230–231, figs. 2).—The authors give a very brief account of the primitive agriculture of the Indian farmer and of the “first and only agricultural engineering course in southern Asia.”

Irrigation water supply system capacities, C. V. GIVAN. (Univ. Calif.). (*Agr. Engin.*, 23 (1942), No. 9, pp. 281–283, figs. 2).—The author presents a graphic method for determining time and quantity of irrigation required from the rate-of-loss curve, water-holding capacity of the top 6 ft. of soil, and the time required to saturate this known capacity of the top 6 ft. at a continuous supply rate of 1 cu. ft. per second. The graphs shown apply to a prune orchard at Davis, Calif., on a Yolo loam capable of holding 0.83 ft. of readily available moisture in the top 6 ft. Under the soil and climatic conditions specified moisture contributions from rainfall between the time in March when transpiration began and the end of October are not considered important.

This graphical method of accounting for changes in the soil-moisture regimen has not been applied to other problems where rates of loss and soil-moisture capacity are different. It is believed, however, that the method can be used to solve even more complicated problems of this type, and might be useful in determining the rates at which any material should be supplied from one or more sources for storage in a series of places where it is required that stored material be available at all times during which it is to be withdrawn from each storage place at known rates of withdrawal.

A short method of determining volume of run-off from water-stage recorder charts, T. L. COPLEY. (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 6, pp. 189, 192, figs. 2).—By the new method the area under the runoff graph is divided into horizontal rather than vertical intervals, and the discharge rate for each interval is multiplied by the average length or duration of the strip to secure the interval and total discharge. In using this method it is necessary first to determine the height of the horizontal interval to be used. For charts with a $\frac{1}{2}$ -gauge height ratio for small plats a 0.02-ft. stage is suggested for accurate reading, since this will be a small division on the chart. The narrower the strip the greater the accuracy obtained and also the greater the amount of

calculation. It is pointed out that only total volume of runoff can be determined by this short method. When hydrographs are to be prepared or rates of runoff or infiltration determined, the conventional method must be used.

Preparing brush land for pastures, R. H. MEANS (*Mississippi Sta. Cir. 108* (1942), pp. 7, figs. 6; also in *Miss. Farm Res.* [*Mississippi Sta.*] 5 (1942), No. 9, pp. 1, 8, figs. 5).—The author reports the clearing of land abandoned for from 2 to 20 yr. at a cost of \$2.38 per acre, the original clearing being done by hand labor with axes, followed by burning of the brush in place and subsequent mowing to keep down sprouts. Mowing two or three times per year was found sufficient. Satisfactory pasture was obtained. Clearing at the cost reported involved the use of labor at 10 ct. per hour, and for this and other reasons mentioned no approximation of the average cost throughout the State could be made. It is believed, however, that much land abandoned from cultivation can be prepared for pasture at a not prohibitive cost.

Soil admixtures for earth walls, R. L. PATTY. (S. Dak. State Col.). (*Agr. Engin.*, 23 (1942), No. 9, pp. 291-294, figs. 5).—At least 80 percent of all soil types, as they will be found on farms over the United States, will be satisfactory for use in rammed earth walls. Two-thirds of these could be used just as they are dug providing the outside surface of the wall is to be protected with stucco or plaster. The other one-third will need at least a small proportion of sand added, even though they are to be plastered. A recommended admixture of sand will make a high percentage of these walls good enough to stand indefinitely as bare walls. For farm buildings no admixtures other than sand are necessary. The sand will make a high-quality soil and the wall may be left standing for a year or two. If it begins to roughen too much it will be in the right condition for stuccoing.

Cinders can be substituted for sand as an admixture to a low-quality soil. Cinders reduced shrinkage and cracking of the wall like sand and reduced the strength in the same proportion. They can be used up to one measure of cinders to one of soil if the wall is to be plastered. Portland cement greatly increased the strength of rammed earth walls when the sand content of the soil was high, but only slightly when the sand content was low. Five percent of portland cement by volume was found insufficient for weather resistance, but 10 percent may prove satisfactory. Snow and ice damaged earth walls containing portland cement admixtures (soil-cement walls) when left in contact with them, and the damage to soil-cement walls was definitely greater than to plain rammed earth walls. Fiber admixtures when well distributed through a soil increased the strength of the wall slightly. Asphalt emulsion has shown very satisfactory results as a stabilizing admixture for earth walls. It lends itself well to adobe-type construction in which the oil can be mixed into puddled soils or mud.

Plating or veneering rammed earth walls with the same soil stabilized with a dependable admixture proved a satisfactory process.

Terrace construction by plowing, D. E. SPRINGER (*Agr. Engin.*, 23 (1942), No. 9, pp. 284, 286, figs. 4).—Some of the advantages of plow-constructed terraces are that the equipment required is available on most average-sized farms in the Corn Belt; the tractor and plow are generally in good condition, and there is no extra work for a farmer to get ready; terraces are constructed more economically with a plow than with some of the conventional terracing machines; one man can do the job—an important factor in a time of farm labor shortage; a farmer uses the same methods for maintenance as for construction; and farmers who practice contour farming can easily build terraces without special assistance. Laying out contour lines at terrace spacings and grades expedites

this work. Some cautions are (1) do not start terrace construction until the terrace system has been designed and satisfactory terrace outlets are established; (2) do not start on too many terraces at one time—build each one sufficiently high to afford protection before starting construction on another; (3) build the top terrace first and work downhill, taking each terrace in succession; and (4) do not give up with the plow method until several replowings of the once-plowed soil have been made—the fact that the plow does not scour is not a sign that it is not moving the soil.

Sapwood depth and absorption limits in round coast Douglas fir timbers, J. D. MACLEAN. (U. S. D. A. coop. Univ. Wis.). (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 117–127, figs. 5).—The author tabulates data on average depth of sapwood in coast Douglas fir poles and piling and formulates the calculation of preservative absorption maximum on the basis of the depth of sapwood, density or specific gravity of the wood, moisture content of the treated wood, diameter of the timber, and the length of the timber. Nomograms helpful in the required computations are included.

The use of preserved wood in home construction, H. L. REESE (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 263–267).—The author points out that, to meet the recommendations of the U. S. D. A. Bureau of Entomology and Plant Quarantine, about 20 percent of the lumber in an average house should be treated for termite and decay resistance, and states that such lumber could be furnished at about 1 percent increase in the total cost of the building. This would insure against much larger costs, incurred a few years later if termite attack has to be combatted.

Creosote treatment of white pine piles, J. F. HARKOM (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 149–150).—From experimental treatments of 2 charges, the first of 7 pieces 6 ft. long and from 10.5 to 14.5 in. in diameter and the second of 11 pieces 8.5 ft. long and from 12 to 16 in. in diameter, the author found that it should be possible to treat white pine piles with 12 lb. of creosote per cubic foot of wood after from 4 to 8 weeks of air-seasoning. Time, temperature, and pressure details of both treatments are stated.

Preservatives, priorities, and processes, G. M. HUNT, R. H. BAECHLER, and J. O. BLEW, JR. (U. S. D. A.). (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 62–84).—The authors believe that the quantity of creosote produced in 1942 for wood preservation from domestic sources will considerably exceed the domestic production in 1941, but that we have entered 1942 with such low stocks that the amount of domestic creosote available for use in 1942 may not exceed that of 1941. The preservative salts in common use or potentially applicable are all of more or less limited availability. Zinc chloride seems least likely to be seriously restricted, but not one of them will be available in unlimited quantities and any or all of them may be less available for wood preservation in 1942 than in 1941. The only toxic preservative that seems, at present, likely to be more available in 1942 than in 1941 is pentachlorophenol. Extenders for creosote and solvents for pentachlorophenol, either in the form of ordinary fuel oils or aromatic byproducts of petroleum cracking processes, seem likely to be available in any quantity that may be needed for wood preservation. Among the substitute materials or practices that seem most promising for immediate use if needed for large volume treating requirements are use of higher percentages of petroleum or tar in creosote solutions, raising the limits on the percentage of creosote distillation residue above 355° C. where such limits have been set up, and use of pentachlorophenol in petroleum solutions.

A study of several products of Disco type low temperature coal tar as wood preservatives, J. J. REID. (Pa. State Col.). (*Amer. Wood-Preservers'*

Assoc. Proc., 38 (1942), pp. 435-447).—The author reports upon wood preservation experiments with fractions obtained from a coal tar formed at relatively low temperature (450°-500° C.) carbonization of coal. Species of *Fomes*, *Lentinus*, *Lenzites*, and *Poria* were used as test organisms. The preservative designated brown solution is described as an aqueous alkaline solution of certain high-boiling compounds, mostly relatively insoluble tar acids of which little, if any, is found in ordinary high temperature coke-oven or gas-retort tars. With suitable procedures, this brown aqueous solution impregnated into wood acts as a nonbleeding preservative, much of which does not leach out under severe test conditions. The second of these preservatives is Disco creosote, a distillate rather similar to, but not identical with, the creosote from low-temperature carbonization for which the service records have been available for some years. The residue from distillation of Disco-type creosote to 355° contains a considerable amount of tar acids and has been found in the preliminary portion of this study to be more toxic to *Fomes* species than the corresponding residue from distillation of high-temperature creosote.

Test blocks of yellow pine sapwood treated at various retentions with each type of preservative made from Disco tar and others treated at various retentions with recognized good commercial preservatives were air seasoned for several months, subjected to severe leaching, and finally exposed to two standard test organisms. Some retentions of both old and new preservatives were low enough to permit early attack. The order in which the blocks showed attack is recorded, together with the relative condition at the end of 9 months' exposure. The effectiveness of adequate treatment with brown solution when treatment has been followed by seasoning and severe leaching was established. The stabilized type of brown solution did not require as high retention as the purified type. Disco creosote compared favorably with high-temperature creosote in this series of tests, including those in which an unusually high-boiling grade of the oil was employed.

Quantity of wood treated and preservatives used in the United States in 1941, R. K. HELPHENSTINE, JR. (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 498-523, figs. 11).—Statistics compiled by the U. S. D. A. Forest Service, with the cooperation of the American Wood-Preservers' Association, for the year 1941 are presented with interpolated discussion.

A study of fireproofing standards for pressure-treated lumber, L. K. ANDREWS (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 462-481, figs. 9).—Various degrees of fire resistance can be obtained by impregnating wood with various retentions of fire-retarding salts (of which only borax and boric acid are specifically named). Fire resistance increased as the retentions of fire-retardant salts were increased, but no substantial degree of fire resistance was observed for retentions less than 3 lb. per cubic foot of wood. Retentions in excess of about 6 lb. per cubic foot were found apparently not justified, however, the increased fire resistance being very slight. The fire tube, crib, and special crib test methods appeared reliable for determining the effectiveness of fire-retardant treatments, but the timber test was not.

Corrosion studies with certain fire-retardant chemicals, A. VAN KLEECK. (U. S. D. A. coop. Univ. Wis.). (*Amer. Wood-Preservers' Assoc. Proc.*, 38 (1942), pp. 160-171, figs. 3).—Under the specific conditions of these tests, the solutions without sodium dichromate were definitely corrosive to all of the metals except borax with respect to brass, steel, and zinc, and the borax-boric acid mixture with respect to steel. Sodium dichromate inhibited corrosion to a greater or less degree in most instances but actually accelerated corrosion by monoammonium phosphate and diammonium phosphate and the monoammonium

phosphate-boric acid mixture with respect to zinc, and zinc chloride with respect to steel. At the concentrations used the minimum quantity of sodium dichromate necessary for good effectiveness was shown to be in the range of 2.5 percent of the fire-retardant chemical present.

Gearing farm machinery to the war effort, F. A. WIRT (*Agr. Engin.*, 23 (1942), No. 9, pp. 285-286, fig. 1).—The author points out that the responsibility of agricultural engineers under present conditions is threefold—(1) to assist in bringing about the best possible use of such new machines as the manufacturers may be permitted to build, (2) to promote efficient use of old machines through proper servicing and stocking of repair parts by implement dealers, and (3) to make known to men in authority their knowledge on all matters pertaining to the application of engineering in agriculture. Comparing the present with two previous wars, the author shows that American production of agricultural machines was increased sharply in 1861-64 and again in 1917-18, and that in England mechanization of agriculture has been greatly increased during the present war. In this country, however, although the farm machinery manufacturers are ready with new designs of more efficient machines with which to do the jobs, for the first time there is a lack of materials out of which to build the machinery needed. He quotes a British agricultural engineering publication to the effect that whereas America has one tractor to every 2 sq. miles, approximately, England now has one to about half that area. He maintains that the only way the food needed by ourselves and our allies can be produced is to have available sufficient farm machines, and that to produce these machines more materials are required than now appear likely to be allocated in 1943. "It should never be forgotten that food, as ammunition for the stomachs of our soldiers, is just as important as ammunition for their guns."

Farm machinery suitable for southern farms, I. F. REED (U. S. D. A.). (*Agr. Engin.*, 23 (1942), No. 6, pp. 186-188, figs. 4).—The author holds that the design of equipment suitable for the one-mule unit has been unduly neglected. It is believed to have been the general opinion of engineers, with respect to the operators, very numerous in the South, of one-mule or two-mule units "that the power available to these farmers so limited their operations that there was little that engineers could do to help." As one example of the possibilities of small-unit equipment, it is pointed out that although the one-mule farmer must use a small plow and a small slip scraper he can make a good terrace and do most of the work during slack times. A small, lightweight V drag is also effective and can be made cheaply on almost any farm. Of small plow attachments showing promise for turning green manure crops, a small coulter with one wire and a jointer are described. Other implements discussed included a single-row stalk cutter and a peanut planter equipped with a large shovel which opens the bed ahead of the planting mechanism.

Methods of handling hay (*Agr. Engin.*, 23 (1942), No. 6, pp. 193-198, figs. 5).—This is a symposium made up of the following discussions: The Significance of Homemade Sweep Rakes, by W. Vutz (p. 193); Sweep Rakes on Indiana Farms, by R. C. Shipman (pp. 193-194) (Purdue Univ.); Baling Method of Haymaking, by L. G. Samsel (pp. 194-195); The Chopping and Storing of Hay, by F. W. Duffee (pp. 195-196) (Univ. Wis.); The Automotive Buck Rake in Ohio, by C. B. Richey and R. D. Barden (pp. 196-198) (Ohio State Univ.); and Factory-Made and Homemade Sweep Rakes Compared, by F. D. Jones (p. 198).

The improved single-impulse electric fence, C. F. DALZIEL (Univ. Calif.). (*Agr. Engin.*, 23 (1942), No. 9, pp. 287-290, figs. 7).—To the fundamental circuit of step-up transformer, two thermionic rectifying tubes, impedances, and con-

denser, the author adds a relay alternatively connected to break either the secondary or the primary transformer circuit and a milliammeter, the relay being of a type opening instantaneously but closing by a delayed action and improving the safety of the fence by accelerating the collapse of the condenser discharge to a voltage harmless to man or animals and incapable of maintaining an arc. A small lightning arrester connected directly across the output terminals protects the condenser from minor static disturbances and from the effects of distant lightning discharges.

The single-impulse electric fence controller is considered to possess two advantages over all other types: (1) Safety—regardless of the time of contact with the fence wire, a human being or an animal receives one and only one single powerful shock; and (2) effectiveness—the fence wire is maintained ready to produce a shock instantly on contact at all times. It is believed that an improved single-impulse electric fence controller with a reasonable leakage current allowance, as here described, should give performance superior to any commercial controller now available.

Electric power serves the dairy farm, G. Q. BATEMAN (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 3, pp. 5, 10, figs. 3).—The author reports concisely upon cost trials of (1) a small hammer mill powered by a 1½-hp. motor used for the grinding of grain for the dairy herd, (2) a three-unit milking machine, (3) a cream separator used to separate skim milk for calves, (4) a 10-gal. water heater, and (5) a utensil sterilizer cabinet. The value on the farm of a small electric motor and the use of electric fly screens for the milk room are also briefly discussed.

Dual motion development in a farm milk refrigerator, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 7, pp. 219-222, figs. 6).—This paper reports the results of cooling fresh milk (1) when the water bath and the milk can were both in motion at the time of loading and the water:milk ratio was 1:7; (2) when the water bath and the milk were both in motion at the time of loading with a 4:9 water:milk ratio; (3) when the method of cooling was as in (2), except that the motion of the water bath and that of the milk was delayed 15 min.; and (4) when the method of cooling was similar to that of (2) and (3), except that the motion of the water bath and that of the can was delayed ¾ hr.

After a delay in agitation there was a separation of the cream and the formation of a cream layer after the third hour, and its rate of cooling was much slower than that of the remainder of the milk. A longer delay in agitation had approximately the same effect on the cream layer. Delay in cooling milk for several hours after it is drawn may cause a more complete separation of the cream and subsequent slower cooling, and uniform cooling is more difficult to obtain. Under specified conditions, dual motion provided most uniform cooling when milk was placed to cool soon after it was obtained.

A study of egg cooling methods, J. W. WEAVER, JR., R. L. BRYANT, and C. ROGERS. (U. S. D. A., Va. Expt. Sta., et al.). (*Agr. Engin.*, 23 (1942), No. 7, pp. 223-229, figs. 11).—The authors did not observe any significant loss in egg weight, either with or without cooling, during holding periods of from 4 to 6 days. Where eggs are sold from the farm semiweekly through a market which considers quantity only, or quantity and weight, there can be no financial gain by cooling eggs. Where eggs are sold on the basis of U. S. Standards of Quality for Individual Eggs or an adaptation of this system, during hot weather a consistent gain in net income of from 1 to 2 ct. per dozen will be effected when eggs are cooled by a carefully selected method. The value of

cooling eggs increases with the length of the holding period on the farm, and with the distance between producer and market increases at least up to 258 miles requiring 2 days in transit.

Taking into consideration economy as well as effectiveness, the most practical of the various coolers tested was that depending upon a wet burlap curtain through which air was driven by a small electric fan. Such a cooler can be constructed for about \$25, including labor. When eggs are shipped twice each week, this cooler has a weekly capacity of six 30-doz. cases, allowing space for cases to be precooled and trays where eggs are initially stored for quick removal of heat.

Improvement of fungicidal and insecticidal effectiveness of dusts (*New York State Sta. Rpt. 1942, p. 29*).—Greatly increased deposition and retention of sulfur dusts, obtained by means of a new dusting machine which provides for vaporizing a small quantity of an oil onto the dust as it leaves the nozzle, are noted.

Machinery for processing sweet potatoes for livestock feed, F. A. KUMMER. (Ala. Polytech. Inst.). (*Agr. Engin., 23 (1942), No. 7, pp. 215-216, figs. 4*).—The author maintains that southern farms are in an unfavorable position with respect to production of carbohydrate feeds, as the yields of corn and other grains are low. The sweetpotato, equal to corn in feeding value, is one crop which is well adapted to the South, fits well into a livestock program, and gives high yields from an acre. In the dried form sweetpotatoes furnish a concentrate comparable to corn, barley, oats, or other grain crops.

As an inexpensive drying surface for sun drying, a soil surface impregnated with asphalt priming oil proved most satisfactory. For shredding, a low-cost machine was made up largely from used automobile parts. A rear axle assembly with wheels and drive shaft was used for the driving mechanism. The torque tube and drive shaft were cut off to a suitable length, and an appropriate length of a separate rear axle, having the tapered and threaded end, was attached to the drive shaft. The drive shaft and torque tube were rotated 90° so as to operate in an upright position. A straight drive shaft roller bearing and race welded into the top of the torque tube provided alignment for the axle part of the drive shaft. Two pieces of 3-in. angle iron were welded to the bottom of the axle housing to support the hopper frame. One axle was cut off 12 in. from the differential and the remaining part of the axle was locked in the housing. The opposite wheel was utilized as the driving pulley. The shredding mechanism was made from a steel disk $\frac{5}{16}$ in. thick and 20 in. in diameter. A wheel hub flange was turned to fit into a $1\frac{3}{4}$ -in. center hole in the disk and bolted into place. The disk was attached to the axle part of the drive shaft. The tapered and keyed end of the axle provided a mounting for the disk flange. The shredding knives were beet-type cosette cutters bolted to the disks over three slots which allowed the shredded material to fall below the disk. A 55-gal. oil drum was cut into two parts and both ends were removed. One-half of the drum was mounted on an angle iron frame directly above the cutting disk to serve as a hopper for the sweetpotatoes. The other half was mounted below the disk to prevent scattering of the shredded material. For transportation, a threaded stub shaft was welded into the end of the axle housing opposite the driving wheel which held the wheel in position and allowed it to idle on the hub bearing. A simple angle iron hitch was welded to the lower frame. The machine could be operated at comparatively high speeds. A power unit of at least 5-hp. capacity was needed. A 5-hp. electric motor and also a tractor with belt pulley was used success-

fully. In a test run, using tractor power, 80 bu. of sweetpotatoes were shredded in 15 min.

A castor bean sheller, M. A. SHARP. (Univ. Tenn.). (*Agr. Engin.*, 23 (1942), No. 6, p. 188, fig. 1).—This sheller operates on the same principle as the small machine previously described (E. S. R., 87, p. 125). The rubber-faced disks are 12 in. in diameter and rotate at 525 r. p. m. No stop bar or rings as used around the central feed opening in the stationary disk of the small machine are necessary on this one, but V grooves about $\frac{1}{16}$ in. wide in the rubber disks improved the efficiency slightly on varieties shelled. The 3- by 16-in. suction fan, running at 1,000 r. p. m., removes all hulls, immature beans, and dust. A $\frac{1}{2}$ -hp. electric motor is used.

Temperature studies in various types of potato storage houses, T. E. LONG (*North Dakota Sta. Cir.* 66 (1942), pp. [4], figs. 4).—The author tabulates fall, winter, and spring temperatures in a bin in a farm-type storage, a bin in a medium-size trackside storage, and bins in two deep bin trackside storages, together with mean monthly temperatures and departures from normal from October 1941 to March 1942, inclusive. He notes that the individual operator will find these records a useful guide to the probable temperature in his own particular type of storage.

Bulk handling of potatoes, H. BERESFORD (*Idaho Sta. Cir.* 86 (1942), pp. 7, figs. 4).—The author describes a pick-up cart having a 6-ft. 10-in. tread, a 6- by 6- by 2-ft. box, and a differential hoist for dumping, and shows its construction detail. Other features of bulk handling are very briefly noted.

Plywood for grain bin construction, F. C. FENTON. (Kans. State Col.). (*Agr. Engin.*, 23 (1942), No. 7, pp. 217-218, 222, figs. 5).—It is claimed that the bin described has some unusual features besides being the first circular all-plywood bin. It is entirely free from vertical framework, thus making full use of the strength qualities of the plywood. It has only three horizontal hoops, made by gluing together four 3-in. strips of plywood. These hoops serve more to give shape to the structure than for needed strength. The bin has walls 8 ft. high, so that one panel applied vertically extends the full height, and is 14 ft. in diameter, a size which permits triangular roof sections to be cut from standard size plywood 4- by 8-ft. panels with almost no waste. The normal strength of plywood (due to the cross banding of the layers of wood used in making plywood) is utilized in the walls as the plywood sheets are glued and bolted together into a one-piece covering which literally is wrapped around three laminated plywood hoops. Design of the bin was drawn specifically to provide a simple granary which could be erected on the farm by the farmer and his helper, or prefabricated by the lumber dealer and hauled to the farm. It can be built by the ordinary handy man, and the design requires no intricate operations.

The specifications are, in part: Capacity, 1,000 bu.; foundation, four 4-in. concrete walls, 12 in. high and about 3 ft. on centers, decking of 2- by 10-in. planks spaced 3 in. apart (a simpler and less expensive foundation would serve); floor, $\frac{3}{8}$ -in., exterior-type fir plywood over 2- by 2-in. joists spaced 12 in. on centers; framework, three laminated plywood hoops on inside of wall at top, bottom, and midheight (hoops are $3\frac{1}{2}$ in. wide, formed of four thicknesses of $\frac{3}{8}$ -in. exterior plywood glued, clamped, and nailed together); wall covering, $\frac{3}{8}$ -in. exterior-type fir plywood (covering applied in one sheet after 4- by 8-ft. plywood panels have been bolted and glued together into a continuous strip to be wrapped around hoops); roof, $\frac{3}{8}$ -in. exterior-type fir plywood over 2- by 2-in. rafters spaced about 2 ft. at perimeter and supported at center by a 16-in. ring of sheet steel; and finish, two coats raw linseed oil and

two coats of varnish on walls, two coats oil and two coats aluminum paint on roof.

Results of tests made on $\frac{1}{4}$ -in. plywood joints using bolted joints, bolted and glued, nailed and glued, each with lapped joints, and butted joints with splice battens are tabulated. Glued and nailed joints seemed to be the most promising method of joining plywood for grain bin construction. Because of the regular thickness, excellent joints can be made by clinching small nails by driving them against a steel plate laid under the joint, a quick and easy method of joining plywood together on the job.

Refrigerated farm apple storages, D. COMIN (*Ohio Sta. Bul. 632 (1942), pp. [1]+68, figs. 16*).—This is a somewhat detailed treatment of building requirements and the choice and effective use of mechanical cooling equipment. The location, size, and construction of the building to be refrigerated for apples are discussed. The dry-coil, forced-air, floor-mounted units are held to afford the greatest satisfaction and economy in refrigeration for apples. Ducts for the distribution of the cooled air are considered an unnecessary expense unless two or more rooms are to be cooled by a single unit. Evaporative or shower-type condensers and cooling towers, which save up to 95 percent of the water that otherwise would be needed to condense the refrigerant, are proving very popular. It has proved feasible to reuse the water pumped through waste water condensers (shell-and-tube, shell-and-coil, and shell-and-finned tube types) by exhausting it on the storage roof either through ordinary orchard spray nozzles or directly onto the roof, where it is cooled sufficiently for reuse after collection in a large reservoir tank. Small window-mounted evaporative-type condensers used as one or more units are very economical and have the advantage of operating as strictly air-cooled condensers as winter approaches and the air temperature drops sufficiently to allow dispensing with water entirely. By using them, the need for heating the machine room to keep the water pipes from freezing is eliminated. It is pointed out that in selecting cooling units (evaporators) of the finned-tube, forced-air type, it is of the utmost importance to have sufficient total coil area that the maximum daily cooling load can be handled with no more than from 8° to 10° F. difference between the refrigerant and air temperatures, and that a proper design will automatically maintain an 85-percent relative humidity during the holding period in a reasonably vaportight room. Other topics dealt with are humidification, arrangements for entirely automatic operation of the refrigeration system, holding temperatures for apples in storage, calculation of the peak heating load to be handled by a proposed refrigeration system, and insulation.

The results of storage tests carried on over a period of years with apples emphasized that the seasonal effect was primarily responsible for the appearance of disorders, with the exception of shrivel, which showed no significant difference due to season. The variety was also of great importance in the occurrence of disorders, including shrivel. The effect of storage, container, and time in storage was not so strongly evident. There was more shriveling after 5 mo. in the refrigerated storage with gravity air movement (33.5 percent) than in one where the air was moved by blower fans (21.5 percent), because of the higher relative humidity held in the latter through the maintenance of higher average refrigerant temperature. There was nearly twice as much shriveled fruit in the crates (36 percent) as in the boxes or baskets (21.7 percent), but in the latter containers there were two and two-thirds times as many scalded fruits. Shriveled fruit appeared to a small extent (8 percent) after 75 days in storage and nearly doubled in quantity by the hundredth day (14 percent), after which the increase in number of fruits showing shrivel was moderate until the two-

hundredth day (24 percent). Scald appeared slightly in 100 days (4 percent), nearly doubled in 150 days (7 percent), and nearly doubled again (13 percent) by the two-hundredth day. The relative humidity of the storage air is of the greatest importance, since fruits should be stored in slatted crates to lessen the occurrence of scald. Forced-air cooling equipment maintaining a high refrigerant temperature answers these requirements.

Investigations in low-cost housing, D. G. CARTER (*Arkansas Sta. Bul.* 422 (1942), pp. 46, figs. 35).—This study of low-cost housing includes an investigation of costs and construction of nine houses in Arkansas, one example of remodeling, and the installation of six sets of plumbing equipment. The variations in the size, material, cost, and method of construction did not permit basing definite conclusions on totals or averages. The data, however, are held to reveal certain general results and possibilities for cost reduction.

Of the total calculated cost of conventional houses, approximating 10.9 ct. per cubic foot, with approximately 2 ct. per cubic foot added if plumbing and electricity are included, about 75 percent was cash expenditure. The value of the noncash, or home, contribution of materials and labor was approximately 50 percent where a definite effort was made to obtain maximum reduction of cash expenditure. Unskilled labor may be used for almost all of the construction work in low-cost housing if some technical supervision is given and planning aids are provided.

AGRICULTURAL ECONOMICS

Current Farm Economics, [October 1942] (*Oklahoma Sta., Cur. Farm Econ.*, 15 (1942), No. 5, pp. 141-171).—Included are the usual review of the agricultural situation, and articles entitled: The Quality of Cotton Produced in Oklahoma in 1941, by K. C. Davis (pp. 149-153) and Some Characteristics of Oklahoma Farm Owners and Their Farms, by R. T. McMillan (pp. 156-164). The tables of prices, indexes of prices and purchasing power of Oklahoma farm products, and indexes of United States and Oklahoma prices, factory payrolls in the United States, and demand deposits in Oklahoma are brought down through August 1942.

Wartime farming on the southern Great Plains (*U. S. Dept. Agr., Misc. Pub.* 496 (1942), [pp. 12], figs. 26).—A popular account, very freely illustrated, of conservation farming in this region.

Wartime farming on the northern Great Plains (*U. S. Dept. Agr., Misc. Pub.* 497 (1942), [pp. 20], figs. 50).—This publication, prepared by H. L. Carr, is similar to the above.

Oklahoma cotton in wartime: A comparison of Oklahoma production and military requirements, K. C. DAVIS and W. A. WILLIAMS (*Oklahoma Sta. Cir.* 105 (1942), pp. 22, figs. 3).—"There is a so-called surplus of 10 million bales of cotton, but most of this cotton is short staple or low grades, or both, and under present conditions cannot be used in America. Therefore, the United States has a surplus of cotton and at the same time a shortage of usable cotton. From the standpoint of profit and also from the standpoint of patriotism, the Oklahoma farmer must not add to this stock of unusable cotton, but must produce the kind of cotton that can go into domestic consumption, namely, the middle staple lengths with grades as high as possible."

Seedtime and harvest today, R. G. HAINSWORTH, O. E. BAKER, and A. P. BRODELL (*U. S. Dept. Agr., Misc. Pub.* 485 (1942), pp. III+97, figs. 109).—This publication is based largely on Circular 183 (*E. S. R.*, 47, p. 295) and a Yearbook article (*E. S. R.*, 39, p. 495). Maps of the United States show by 10-day periods the dates of seeding and harvesting, and in some cases other operations,

for winter wheat, spring wheat, winter oats, spring oats, corn, cotton, tobacco, potatoes, sugar beets (thinning only), and field beans; and of harvesting grain sorghums, timothy and clover, alfalfa, Elberta peaches, Delicious apples, strawberries, cranberries and oranges, green or snap beans, cantaloups and muskmelons, green peas, onions, lettuce, and asparagus grown for sale. Other maps (usually for 1938 or 1939) show the number of tractors on farms; percentage of land broken (plowed, listed, bedded, etc.), disked, and harrowed with tractor-drawn implements; percentage of wheat acreages harvested with combines; percentage of acreage of small grains drilled with tractor-drawn drills, cradled, and harvested with tractor-drawn machines; oat acreage harvested by different methods; corn acreage planted by hand and machine method; percentage of corn cultivated with animal-drawn cultivators; acreage of corn cut by different methods; hay acreage cut by tractor- or animal-drawn mowers; percentage of cotton cultivated with animal-drawn cultivators; and percentage of seed cotton hauled to gin with animal and mechanical power. Graphs show monthly distribution of labor per acre in designated areas for growing, harvesting, and marketing spring and winter wheat; growing and harvesting corn; producing cotton; and growing, harvesting, curing, preparing, and marketing tobacco. Other graphs show the number of family and hired workers in agriculture in the United States 1900-40, the relation (1910-40) of employment in agriculture to size of agricultural enterprise, and the number of tractors and of mules and horses on farms on January 1, 1915 to 1941.

An economic study of land utilization in Schuyler County, New York. L. B. DARRAH ([*New York*] *Cornell Sta. Bul.* 781 (1942), pp. 40, figs. 29, map 1).—The county, the land-use problem, the crops, livestock and dairy production, types of farming, etc., are described. The rural lands are divided into five different classes for farming, and analysis is made of the land use by land classes and by tenure, the soils in each land class, the number and value of properties, the tax base in each town, etc. Programs are suggested for the development of roads, rural electrification, and reforestation.

Significant changes in agriculture of Cumberland County, Tennessee. C. E. ALLRED, H. J. BONSER, and E. J. LEBRUN (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 139 (1942), pp. [1]+II+38, figs. 26).—Since many of the farms are self-sufficing, with a high degree of part-time farming, a relatively decentralized agricultural marketing system has developed, which operates largely through small markets and to consumers within the area. Beef cattle, sheep, and hogs are the principal types of livestock grown for market. The area in farms has decreased from 177,926 acres in 1860 to 128,874 acres in 1940. This has meant a decrease from 42.4 percent of the total area in farms in 1860 to 29.7 in 1940. Farms have decreased in size from 116.6 acres per farm in 1860 to 62.5 acres in 1940. The number of farms, on the other hand, have increased from 260 in 1860 to 2,063 in 1940. The total number of animal units increased from 5,241 in 1860 to 12,502 in 1940. Horses decreased in number, while mules increased in number. On a per-farm basis, the number of milk cows, beef animals, hogs, sheep, and poultry decreased in number, but due to an increased number of farms there was a greater number of each class of livestock in 1940 as compared to 1860.

Economic conditions and problems of agriculture in the Yakima Valley, Washington.—IV, Hop farming, H. F. HOLLANDS, E. B. HURD, and B. H. PUBOLS. (Coop. U. S. D. A.). (*Washington Sta. Bul.* 414 (1942), pp. 33, figs. 4).—Continuing this series of investigations (E. S. R., 87, p. 436), hops were grown successfully throughout parts of the valley, but several thousand acres of land not now producing hops are physically adapted to the crop. Acreage planted

to hops in the valley could be doubled if and when there are profitable market outlets. However, the hop industry will support relatively few farmers in a few favorable locations, and relatively large capital resources are required for hop growing. In 1937, the average cost of producing hops on 27 hop farms was 19.1 ct. per pound. Out-of-pocket expenses of 12 of the 27 hop growers were higher than the average price received for their hops, and total costs of production (out-of-pocket and all other) of 22 of the 27 growers were higher than the average price received, 16.8 ct. About 85 percent of the hop crop is marketed through dealers or handlers who buy directly from the producers or through appointed brokers and sell directly to the consumers and brewers. Many dealers also are producers, and only a small part of the crop is sold directly to consumers by growers who are not dealers.

Satellite acres: A study of 1,100 households in rural Rhode Island with income from combinations of non-agricultural employment and agricultural production, W. R. GORDON (*Rhode Island Sta. Bul.* 282 (1942), pp. 80, figs. 34).—Production for a major proportion of the families represented in this study was a spare-time endeavor, and what selling of products occurred was, in the main, by either of two methods, sales to the neighbors or sales to wholesalers, so that even the marketing was of the kind that requires a minimum of time and attention of the producer, or was such as could be done at irregular times. Subsistence and noncommercial production develop into part-time and commercial farming in the poultry and dairy enterprises. The nonagricultural work which these families combined with their agricultural production was subdivided into five major classes as follows: Semi- and unskilled, skilled, service, proprietary, and professional. Skilled workers and proprietors appeared to be more inclined to combine nonagricultural employment with agricultural production than the other three. But the largest proportion of each single class was in the back-yard and small-scale production divisions. The semi- and unskilled produced for home consumption. Skilled workers inclined to production for sale from small farming units. Proprietors inclined to commercial production. The nonagricultural employment was virtually full-time employment for most of the household heads. Two-fifths of all male heads were foreign-born. They came more frequently from farms. The Rhode Island natives were mainly from villages. Those from other States in the United States were mostly from cities. The data suggest the possibility that a combination of farming and nonagricultural employment is an arrangement engaged in by these people in their early middle years, foreign-born entering early and staying in it.

The place of woodland in the farm organization in Coos County, New Hampshire, J. M. CHANDLER. (Coop. U. S. D. A.). (*New Hampshire Sta. Bul.* 337 (1942), pp. 34, figs. 4).—Data concerning the present farming resources and organization, hours of man and horse labor used in woodland operations and additional labor available for such operations during a normal year, and the operator's interest in more woods work were obtained from 80 farms in three towns of the county. Information was also obtained as to prices and trucking costs. The woodlands, the markets for forest products, the labor situation, the present status of forest lands—ownership, merchantable timber, growth of timber, and income from timber—forest management, etc., are described and discussed. Illustrations as to how incomes might be increased are included for a medium-sized dairy-potato farm with a substantial acreage of woodland, a large dairy-potato farm with a small acreage of woodland, and a small dairy farm with little woodland.

Agricultural finance: Principles and practice of farm credit, W. G. MURRAY (*Ames: Iowa State Col. Press, 1941, pp. X+328, figs. 30*).—The first part of this textbook, principles of farm credit, includes chapters on use of farm credit; classification of farm credit; balance sheet analysis; income analysis; marginal analysis; natural hazards, insurance, and loan policy; price risk and loan policy; security and budgeting for short-term credit; buying a farm on credit; payment terms; interest rates; and credit instruments and foreclosure procedure. The second part, analysis of lending agencies, includes chapters on function and classification of lenders; insurance companies; farm mortgage middlemen; commercial banks; merchants and dealers; Farm Credit Administration and other public agencies; Federal land banks; Land Bank Commissioner loans and the Federal Farm Mortgage Corporation; joint stock land banks; foreclosure problems of F. C. A. agencies; the national farm loan association problem; intermediate credit bank system; production credit corporations and associations; banks for cooperatives, Commodity Credit Corporation, and Rural Electrification Administration; emergency crop and feed loans; Farm Security Administration program of rehabilitation loans and debt adjustment; tenant-purchase loans; and governmental farm credit and tenancy. Each chapter is followed by questions and problems and a list of references.

Ninth annual report of the Farm Credit Administration, 1941 (U. S. Dept. Agr., Farm Credit Admin., Ann. Rpt., 9 (1941), pp. VI+273, figs. 22).—This report is of the same form as that for the previous year (E. S. R., 86, p. 544).

Farm debt adjustment in Michigan through the Farm Security Administration, H. E. LARZELERE. (Coop. U. S. D. A. et al.). (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 47-65, fig. 1).—This article describes the policies and procedures followed by the Farm Security Administration farm county debt adjustment committees in dealing with individual debt adjustment cases and analyzes the assembled data with respect to the financial conditions of the applicants, the nature and extent of debt scale-downs effected by the committee mediations between creditors and debtors, and of refinancing arranged through the Administration. It is based on data obtained from the Milwaukee regional office of the Administration covering 523 debt adjustments in 65 counties of Michigan handled by the committees between 1937 and 1940.

Characteristics and cost of short-term farm loans made by Ohio country banks, P. S. ECKERT and J. I. FALCONER (*Ohio Sta. Bul.* 633 (1942), pp. [1]+22).—Detailed descriptions of 3,049 short-term loans were obtained from 81 country banks in 30 counties. The characteristics of the loans—size, purpose, length, renewals, payments, and security given—contract rate of interest, true per annum cost, etc.—are discussed. Analyses are made of 1,518 of the loans covering the costs of individual loans and of all loans combined, cost with different contract rates of interest, cost of loans of different sizes and lengths, cost according to number of payments, cost where interest was taken at maturity and where loans were discounted, cost with and without chattel mortgages, and cost with and without minimum charges.

Of the total loans studied, 84.7 percent were for less than \$500, the most common size being \$100. Most of the loans became due in 90 days. There was a direct relationship between length of "due periods" and size of loans. About 50 percent of the loans were paid at the first maturity date and about 20 percent before the due date. About two-thirds of all paid loans were paid without being renewed. Most of the remainder were paid with less than six renewals. Nine-tenths of the loans were paid with less than six payments and 55.6 percent with one payment. The median of the costs of 1,518 loans was 6.963 percent. There

was an inverse relationship between cost of loans and their size, the cost ranging from 11 percent for loans of less than \$50 to 6.3 for loans of \$1,000. Costs of loans decreased with length of loan up to 270 days. Discounted loans cost 7 percent, while loans with interest taken at maturity were 6.6 percent. The cost of all minimum-charge loans averaged 8.2 percent as compared with 6.6 for those without a minimum charge. For all loans there was but slight difference in the cost of those involving and not involving chattel mortgages. For loans of less than \$200 with and without chattel mortgages the cost were 8.9 and 7.4 percent, respectively.

Interest charges payable on farm indebtedness in the United States, 1910-40, H. T. LINGARD and W. O. BROWN (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, pp. [1]+46, figs. 8*).—A summary of available data, in part previously noted (*E. S. R., 87, p. 488*).

Agricultural credit in Germany, W. BAUER (*[U. S. Dept. Agr.], Farm Credit Admin. [Bul. CR-1] (1939), pp. VI+98, figs. 5*).—This is the first bulletin of a series on agricultural credit in foreign countries. Part 1, Economic Aspects of the Agricultural Credit System, includes sections on sources of farm mortgage credit, economic history and background, debt-relief legislation and mortgage debt, agricultural credit under National Socialism, agricultural credit on personal security—short- and medium-term credit, and a statistical survey of total agricultural indebtedness. Part 2, Some Technical Aspects of the Basic Farm Mortgage Credit System, contains sections on organizational structure of lending agencies, methods and principles of raising or allocating funds for making farm mortgage loans, and lending policies. A bibliography is also included.

Agricultural credit in Denmark, W. BAUER (*U. S. Dept. Agr., Farm Credit Admin. Bul. CR-2, (1940), pp. [2]+IV+71, figs. 2*).—This is the second of the series noted above. Part 1, Economic Aspects of Agricultural Credit in Denmark, includes sections on the main characteristics of Danish agriculture, farm credit implications of the agricultural situation, and development and structure of agricultural indebtedness. Part 2, Organizational and Technical Aspects of the Agricultural Credit System, contains sections on mutual credit associations (*Kreditforeninger*), mutual mortgage associations (*Hypotekforeninger*), savings banks, other private mortgage creditors, government sources of mortgage credit, government sources of medium- and short-term credit, and private sources of medium- and short-term credit. A bibliography is also included.

Agricultural credit in Canada, J. L. WOOSTER and W. BAUER (*U. S. Dept. Agr., Farm Credit Admin. Bul. CR-3 (1941), pp. [2]+IV+63, figs. 2*).—This third bulletin of the series describes the situation of agricultural credit in Canada before World War II in sections on sources of agricultural credit, government-sponsored farm mortgage credit, history of government-sponsored farm credit in the Provinces, extent of indebtedness, and measures for the relief of indebtedness. Appendixes describe the land settlement credit schemes established by the Dominion and the Provinces and the Cooperative People's Banks of Quebec and include a bibliography.

Land tenure policies at home and abroad, H. W. SPIEGEL (*Chapel Hill: Univ. N. C. Press, 1941, pp. XII+171*).—Analyses and discussions are included in chapters on foundations of land tenure policy, the legal background of land tenure in the United States, facts and factors in European and American land tenure, farm tenancy policy, English land tenure policy, and land tenure under the Swastika. A bibliography covers the several sections of each chapter.

An analysis of farm mortgage experience in Kent County, Delaware, M. M. DAUGHERTY (*Delaware Sta. Bul. 237 (1942), pp. 65, figs. 21*).—The objective

of this investigation was to throw light on the safety of investments in farm mortgages in Kent County from 1912 to 1933, for the purpose of measuring the losses that have accrued, and thereby enabling lenders on the one hand and borrowers on the other to judge the risk involved. It is concluded that the experience in Kent County "does not indicate that the field of investment has been unprofitable, or that the lending or borrowing on farm mortgages is endowed with extraordinary hazards."

An analysis of the land acquisition program under Title III of the Bankhead-Jones Farm Tenant Act, T. E. WILKINS and G. B. MCINTIRE (*U. S. Dept. Agr. Soil Conserv. Serv., 1942, SCS-MP-26, pp. [1]+34, figs. 2*).—"The submarginal land purchase program of the United States Department of Agriculture is conducted by the Soil Conservation Service under authority of Title III of the Bankhead-Jones Farm Tenant Act, approved by Congress July 22, 1937. Under Title III of this act the Secretary of Agriculture is 'authorized and directed to develop a program of land conservation and land utilization, including the retirement of lands which are submarginal and not primarily suitable for cultivation, in order thereby to correct maladjustments in land use. . . .' In order to effectuate this program the Secretary of Agriculture is authorized to 'acquire by purchase, gift or devise, or by transfer from any agency of the United States or from any State, Territory, or political subdivision, submarginal land and land not primarily suitable for cultivation, and interests in and options on such land.' The purpose of this study is to show, in a general way, the procedures and methods employed in acquiring land under Title III of the act; to recommend changes in methods and procedures whereby the process of land acquisition can be improved; to analyze the effects of adjustments in methods and procedures on the progress of land acquisition; and to present information relative to the land and improvements acquired and data relative to the ownership and occupancy of the land previous to its acquisition. The information used in this study was obtained from the records and files of the Land Acquisition Division of the Soil Conservation Service. The period covered is from January 1938 to June 1941."

Special improvement district finance in Arkansas, E. E. SPARLIN (*Arkansas Sta. Bul. 424 (1942), pp. 32, figs. 8*).—"The chief purpose of this study has been to determine the indebtedness, extent of default, assessments levied, delinquency, income, and expenditures of special improvement districts, rural and urban, in relation to the financial operations of these districts. The methods used have included the collection of information from county, city, and district records on indebtedness, assessments charged and delinquent, and financial operations, and the arrangement of such information to reveal the essential facts pertaining to the financial problems of the districts." The legislation authorizing and the organization and administration of improvement districts in the State are briefly described. Tables are included and discussed showing data as to the indebtedness, assessments, delinquencies, etc., of levee and drainage districts, bridge, farm-to-market road, suburban road, fence, and paving, curb and gutter, sidewalk, sewer, water, light, and gas districts. The problems of the different types of districts and of the districts in general are discussed.

The indebtedness of the 619 improvement districts with debts outstanding in 1940 was \$34,547,782, of which \$3,436,751 was in default. In 1937 the 658 districts with assessments charged levied \$5,613,232 against the real estate within the districts. Of 8,738,195 acres in the levee and drainage districts, 8,804,390 acres were included in two or more overlapping districts. The percentage of levee and drainage assessments not paid when due, from 1928 to 1933, increased from 24.4 to 72.5 percent, and then decreased each year to 36.1 percent in 1939.

"Districts with annual assessments of less than 20 ct. per acre had 31.3 percent of their assessments delinquent in 1937, while those with \$1.50 and over per acre had 86.7 percent delinquent. . . .

"In the entire improvement district system in the State, whether rural or urban, there is need for a better coordination and administration. In the case of rural districts, present evidence indicates that the State should establish a department of government authorized to coordinate and, to the extent necessary from a State viewpoint, supervise these districts. As most of the rural districts have as their principal objective the control of water in the lowlands, the State agency established to better the improvement district situation should have sufficient powers to coordinate completely the protection and drainage efforts of all areas in the State subject to such problems. These reforms would eliminate the inadequate administrative methods now used, and, if intelligently administered, would greatly improve the usefulness of these districts, especially the drainage districts that often are not adequately performing the function for which they were established. In the case of municipal districts, because of their strictly local nature, major control might well remain with the municipality, with the exception that all such districts should be audited annually by the State. In each city one person should serve as secretary and collector for all districts. This increases the efficiency of handling the accounts, and places all records in a central office, where the municipal officials and citizens can more easily observe the transactions of the district."

Farm buildings and the land, J. T. STONE (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 32-40, figs. 9).—The author relates the type of farm buildings to the class of land in 5 counties. Of the 5,589 classifications made of farm homes, 51 percent were considered adequate, one-quarter were poor, 6 percent pioneer ventures, and one-fifth abandoned or unfit for occupancy.

Haying practices and machinery in Knox County, Tennessee, C. E. ALLRED and B. H. LUERKE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 140 (1942), pp. IV+34, figs. 10).—The data for this report were obtained from a survey of 115 farms in 4 civil districts of the county made in 1939 by teachers of vocational agriculture in 2 high schools. Findings as to haying machinery and equipment, haying practices, quality of hay, losses of hay, and miscellaneous practices are presented and discussed.

The prevention of accidents on farms and in homes (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1942, pp. [3]+49+V).—"This report attempts an analysis of farm- and home-accident data collected from all available sources and representing practically all types and conditions of agriculture in the country. Although incomplete in regard to many sections, where information is not being collected, the data [are] believed sufficient to give basic direction for a generalized approach to the problem of prevention or compensation in the event of accidental injuries." The four sections of the report deal with farm and home accidents, organized programs for agricultural-accident prevention, articles of miscellaneous nature on agricultural accidents, and safety education in accident prevention. The fifth section, "report by States," includes analyses of available agricultural-accident data, together with notes on the application of farm labor to the provisions of workmen's compensation laws by States. Appendixes include tables showing by States the claims and medical expenses of farm labor under workmen's compensation and amount of payroll, policy years 1935 and 1936 combined; workmen's compensation premium rates for farm labor by States; individual accident reports of farm labor from workmen's compensation experience; and a suggested questionnaire form for reporting farm accidents.

Size and efficiency in farmers' mutual fire insurance companies. V. N. VALKENBURG (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 54* (1937) pp. [2] + 28, figs. 8).—This study is based on data, compiled with the assistance of H. I. Johnston, for 1,804 companies for each of the years from 1935 to 1937, respectively. Analysis is made of the relations between annual costs of insurance and extent of business territory, volume of insurance, and concentration of business. The authors state that "in summary it may be said that, although a given business territory and a given volume of business may be more conducive to low cost than larger or smaller territories and volumes, they are at most minor contributing factors. Concentration of business, or at least a reasonable volume in relation to the territory operated in, is somewhat more significant as a cost factor."

The marketing of Washington apples in Los Angeles, California.—Part II, Retail distribution. M. T. BUCHANAN and E. F. DUMMEIER (*Washington Sta. Bul. 415* (1942), pp. 68, figs. 7).—This second bulletin of the series (*E. S. R.*, 86, p. 851) is based on information obtained from representatives of 10 chain store headquarters and from the owners or managers of 220 individual retail outlets, of which 20 were in the high-income areas and 117 and 83, respectively, in areas of medium and low income. Ninety-seven of the records are for supermarkets and the remainder for stores grouped into 3 classes, primarily on the basis of size. The volume data are based on 1 week's sales during January or early February 1941 of oranges, apples, grapefruit, bananas, pears, and grapes. The data are analyzed and discussed in sections on quantities of fresh fruit sold weekly, retail prices and gross margins, waste or spoilage, and miscellaneous factors relating to apple marketing—condition, display, advertising, brands, pack, size, and source of retailer supplies.

The average weekly sales per store were: Oranges 1,002 lb., apples 774, grapefruit 432, bananas 250, pears 71, and grapes 11 lb. The average realized retail prices per pound (retail price adjusted for spoilage) were: Apples 5.3 ct., oranges and grapefruit 2.5, pears 4.7, bananas 5.4, and grapes 6.1 ct. The average gross margin on apples was 34.2 percent of the realized retail price. For the other fruits they were: Grapefruit 54.4, oranges 48.9, pears 34.2, grapes 29.3, and bananas 21.5 percent. Supermarkets made the higher gross margins. The gross margins in high-income areas were significantly higher than in medium- or low-income areas. Realized retail prices for apples, oranges, and grapefruit declined as the volume of sales increased. Average losses from waste or spoilage ranged from 3 percent for grapefruit to 5.6 for apples and bananas, and 5.9 percent for pears. About three-fourths of the supermarkets and one-third of the stores in the high- and medium-income areas and 8 percent of those in the low-income areas advertised apples. More than two-thirds of the retailers stated no brand preference. With the exception of Rome Beauty, medium-sized apples were preferred by all retailers.

Livestock marketing practices in South Dakota. W. P. CORRON (*South Dakota Sta. Bul. 362* (1942), pp. 79, figs. 44).—This study was a part of the regional study conducted in cooperation with 13 other State experiment stations in the Corn Belt area and the U. S. Department of Agriculture. The data for South Dakota were obtained from questionnaires mailed to 10 percent of the farmers in each county, 454 additional questionnaires obtained by personal visits, questionnaires obtained from 23 of 50 livestock auction agencies, 70 of the some 900 livestock dealers, truck buyers, and custom truckers, all (9) livestock shipping associations, all (9) packing plants, 1 concentration yard, and 17 retail meat dealers who did their own slaughtering. The State was divided into 7 areas on the basis of type of farming, together with distribution of differ-

ent species of livestock. Producers' practices when selling and when buying livestock, the market information used and the reasons for selecting particular types of markets, the characteristics and practices of the different marketing agencies, the regulation and supervision of marketing, and the livestock marketing problems in the State are discussed. The findings show both for South Dakota and the Corn Belt area for feeder and slaughter cattle, hogs, and sheep and lambs where sales and purchases were made, the size of lots, the relationship between sales of livestock and type of market, the average weight of animals, methods of transportation used, grades of animals, proportion of the animals handled through cooperative marketing associations, sources and disposition of livestock handled by different types of markets, trade of areas of different types of markets, etc.

Market classes and grades of dressed veal and calf carcasses, W. C. DAVIS and C. M. HARRIS (*U. S. Dept. Agr. Cir. 103, rev. (1942), pp. 32, pls. 18, fig. 1*).—A slightly revised edition (E. S. R., 63, p. 263).

Use of the level production plan in milk marketing, L. F. HERRMANN and W. C. WELDEN (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 57 (1942), pp. [2]+23, fig. 1*).—The Chicago base plan of purchasing milk for the Chicago market was discontinued in 1939, and the level production, or quota, plan adopted in the Janesville market in 1940 was developed to encourage seasonal uniformity of production. "The present study compares the effect of both plans on producers' incomes and analyzes producers' own appraisals of the new plan. Personal visits to the farms of more than 50 of the producers supplying the Janesville, Wis., market afforded a broad cross section of producers' attitudes. Complete data on 5 years' milk deliveries of the 72 producers on that market in June 1941 were obtained from association records. The brief experience of the Janesville market is supplemented with conclusions drawn from 10 and 5 years' use of similar plans in the Chattanooga, Tenn., and Hartford, Conn., markets."

Cooperative creameries in South Dakota, W. P. COTTON, G. LUNDY, and L. M. BROWN (*South Dakota Sta. Bul. 363 (1942), pp. 31, figs. 9*).—Information regarding the organization, membership, patronage, trade territory, method of financing, buying and sales policies, and financial statements was obtained for 33 cooperative creameries in the State. Operation statements and balance sheets were obtained covering the business in 1938 and 1941. The characteristics of the dairy industry in the State and the organizational and characteristics of cooperative creameries are described. The financing of the cooperative creameries, the volume of business, methods of assembling butterfat, and butterfat buying policies are discussed. Analysis is made of the effects on net returns of volume of business, investment, cost of procurement, manufacturing and administrative expenses, percentage overrun, marketing operations, byproducts sales, and side line enterprises.

Honey marketing as the grocer sees it, G. N. MORRIS. (*Mich. Expt. Sta.*). (*Gleanings Bee Cult.*, 69 (1941), No. 8, pp. 492-493; *abs. in Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, p. 73).—This article briefly summarizes and discusses data obtained from a questionnaire returned by 230 independent retail grocers in 29 Michigan cities regarding kinds of honey sold, sources of supplies, advertising and displays, size of containers used, and suggestions for improvement of honey marketing.

Better income for truck growers as markets improve, M. GUIN (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, p. 7).—A brief statement is made regarding the average receipts, expenses, labor income, yields, prices for products, etc., for 80 Copiah County truck farmers in 1941.

World wheat survey and outlook, September 1942, J. S. DAVIS (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 19 (1942), No. 1, pp. [2]-24, figs. 4*).—World net exports in 1941-42 were in the neighborhood of 400 million bushels, the smallest since 1896-97. Canada supplied some 55 percent of the total, Argentina about 20. Aggregate wheat supplies in the world ex-Russia are this year huge beyond all precedent, yet blockades and shipping stringency continue to limit drafts on burdensome overseas surpluses to 'relieve bread-grain shortages where they exist. Soviet Russia, whose food position has been seriously impaired by the Axis gains of recent months, needs more import wheat than is likely to reach her. Phenomenal crops in North America include bumper wheat harvests in the United States and Canada from record yields on the lowest acreage sown in many years. With enormous stocks of old-crop grain, North American wheat supplies for 1942-43 are over 50 percent larger than in the depression years of superabundance. Acute storage crises have been or are being successfully met, but at heavy cost. The 1943 carryover in North America may exceed 1,500 million bushels, which is more than the two countries ever produced in any year prior to 1942.

Price comparisons for Arkansas rice, O. J. HALL (*Arkansas Sta. Bul. 423 (1942), pp. 48, figs. 8*).—"The purpose of this study is to show the price paid Arkansas farmers for rough rice for the period 1931-32 to 1940-41. Factors that affect prices paid farmers for rice are considered, including price by varieties, grades, months, and mills. Relationship of rice prices to long-time planning for production is also treated." The data were obtained from purchase slips for from three to eight Arkansas mills. A table is also included and discussed showing the acreage, production, yield per acre, price per bushel, and purchasing power of rice in Arkansas, 1905-41.

The prices of rough rice, 1905 to 1940, varied from 35 ct. per bushel in 1932 to \$1.97 in 1919. During the period 1931-32 to 1940-41 the average annual prices varied from 38.8 to 85.3 ct., averaging 67.3. The average for Blue Rose was 73.7 ct. and for Early Prolific 59.7. From 1931-32 to 1937-38 the price of grade 1 rice averaged 4.4 ct. per bushel more than that for grades inferior to grade 1. "Analysis of differences between the lowest prices paid for grade 1 and the highest paid for grades inferior to 1 shows that, typically, the prices for the best lots of grades inferior to 1 are higher than the lowest prices paid for grade 1 for the same variety sold to a mill during the same day, week, or month. Additional grades or subgrades of rice appear highly desirable." Mills purchased from 45 to 50 percent of the annual purchases during October and November, the monthly averages being 25.6 and 21.2 percent, respectively. From 1905 to 1941 "the time between the high points on acreage deviations from secular trend was from 6 to 8 yr., except in the last period studied. Analysis of the data shows that deviations from the trend are greatly affected by the relative level of the purchasing power of rice for the year previous to the one for which planting operation and production occurred."

Recent developments in sampling for agricultural statistics, G. W. SNEDECOR and A. J. KING. (Iowa State Col. and U. S. D. A.). (*Jour. Amer. Statist. Assoc.*, 37 (1942), No. 217, pp. 95-102).—A paper presented before the American Statistical Association at New York City, December 28, 1941.

RURAL SOCIOLOGY

The farmer and the war (U. S. Dept. Agr., *The Farmer and the War*, Nos. 1 (1942), pp. 7, figs. 3; [2], pp. 8, figs. 8; 3, pp. 10).—In this series of leaflets No. 1 deals with land values and No. 2 with farm parity prices. No. 3, Farmers

and a Stable Economy, discusses the seven-point program outlined by President Roosevelt in his radio talk on price control, April 28, 1942.

Migratory beet workers in Michigan, J. F. THADEN (*Michigan Sta. Spec. Bul.* 319 (1942), pp. 47, figs. 8).—This is a study of certain social aspects of Mexican labor employed in the sugar beet industry of Michigan. Approximately 12,000 farmers produced sugar beets, four-fifths of whom hired workers. About 85,000 acres are worked by hired labor, requiring from 70 to 75 hr. per acre. Out of some 12,400 sugar beet laborers in the State in 1939, about 7,000 were Mexican migrants from Texas, and many of the 4,800 resident beet workers were Mexicans who had migrated from Texas or Mexico during the past two or three decades. In 1941, approximately 6,000 Mexican laborers were recruited in Texas. Another 1,000 migrated from Texas without registering at the employment center or passing through the health center. Their ages ranged from 14 to 78 yr., the average being 28.8 yr. while the median age was 23.8. Seventeen-year-old workers were the most numerous, followed by those 19, 18, and 16 yr., respectively. Less than one-fifth of the farmers provided housing facilities. The average worker cared for 7 acres apiece. Because of conditional government benefit payments, the Agricultural Adjustment Administration specified the minimum wage for sugar beet workers. For 1939, 1940, and 1941 the payment for blocking, thinning, and hoeing was \$11 per acre, and for harvesting a certain rate per acre was paid depending upon yield per acre. For a yield of 9.4 net tons per acre this rate was \$8.67 per acre. In 1941, 1,800 Mexican beet workers came to Michigan and Ohio by train at special rates, while others came in automobiles or trucks—the majority in their own conveyances. Child labor provisions of the Sugar Act of 1937 would not allow employment of children under 14. Eight-week summer schools were operated in 22 centers in the State in 1942. Conditions under which migratory beet workers are employed have shown steady improvement in recent years.

Migratory sugar beet workers, H. TITUS (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 1, pp. 1-8).—A condensation of the above.

Culture of a contemporary rural community, Landaff, New Hampshire, K. MACLEISH and K. YOUNG (*U. S. Dept. Agr. Bur. Agr. Econ., Rural Life Studies No. 3* (1942), pp. [4]+117, figs. 10).—This is the third in a series of six reports on rural communities studied contemporaneously during the year 1940 (*E. S. R.*, 86, p. 697).

Culture of a contemporary rural community: The Old Order Amish of Lancaster County, Pennsylvania, W. M. KOLIMORGEN (*U. S. Dept. Agr., Bur. Agr. Econ., Rural Life Studies No. 4* (1942), pp. [4]+105, figs. 13).—The fourth in these studies of six communities presents sections on the identification and characterization of what is termed a socio-religious, strictly rural community, history and background of the settlement, making a living, community organization and values, the farmers' expanding world, and integration and disintegration in community and individual life.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Permanent agriculture: A textbook of general agriculture, W. SCOTT and J. B. PAUL (*New York: John Wiley & Sons; London: Chapman & Hall, 1941*, pp. XVI+614, figs. 210).—"The subject matter presented in this textbook is . . . more inclusive than what is usually found in books on the subject of general agriculture. It presents not only problems of how to grow crops and breed animals but also other problems, such as cooperation, taxation, credit, conservation, and education."

Farm management livestock manual (including poultry and bees) R. L. ADAMS (*Berkeley: Univ. Calif., 1941, pp. [2]+IV+157*).—"This Farm Management Livestock Manual contains various data useful when planning, testing, analyzing, and appraising livestock and related enterprises. The data pertain to beef cattle, dairying, hogs, sheep, turkeys, poultry, rabbits, goats, and bees."

Mathematics in agriculture, R. V. McGEE (*New York: Prentice-Hall, 1942, pp. IX+189, figs. 87*).—"A practical book on mathematics designed especially to fit the needs of persons interested in agriculture." The several chapters cover mathematical operations; percentage; equations; lengths, areas, and volumes; ratio and proportion; the right triangle and trigonometry; averages; graphs; special applications of practical measurements; and exponents, logarithms, and the slide rule. Tables "contain information which possesses practical value for anyone engaged in agriculture."

FOODS—HUMAN NUTRITION

[Foods and nutrition studies by the New York State Station] (*New York State Sta. Rpt. 1942, pp. 25-27*).—This is a brief progress report (E. S. R., 86, p. 550) concerning studies on the freezing preservation of meats and poultry and fruits and vegetables; the preparation of maraschino cherries and glacéed fruit; the vitamin content of vegetables, fruits, and fruit juices; the nutritive value and palatability of dehydrated vegetables; the chemistry of pectin and pectic enzymes; and quality studies with vegetable canning crops.

What the kitchen owes to science, M. S. PITTMAN. (Kans. State Col.). (*Kans. State Bd. Agr. Bien. Rpt., 32 (1939-40), pp. 91-110, figs. 3*).—This popular review concerns the contributions of applied research to problems in food preparation, specifically in meat cookery; use of eggs; use of milk and milk products; use of fats and oils; preparation of breads, batters, and doughs; sugar cookery; cooking of fruits and vegetables; and jelly making.

The home preparation and preservation of food, M. C. PFUND. (Cornell Univ.). (*Jour. Chem. Ed., 19 (1942), No. 3, pp. 138-143*).—This is a discussion of the chemistry involved in many everyday cooking procedures.

Frozen foods and our civilian food supply, H. CARLTON. (Univ. Tenn.). (*Ice and Refrig., 103 (1942), No. 4, pp. 235-239*).—This report reviews the critical food situation, particularly as it applies in Tennessee, and points out how little of nonrecurring critical material would be required for additional freezing facilities in comparison with the critical materials used for cans alone in preserving the necessary protective foods by canning for even one season.

Freeze fruits and vegetables for variety, D. KNOWLES. (N. Dak. Expt. Sta.). (*N. Dak. Agr. Col. Ext. Spec. Cir. A-22 (1942), pp. [4], figs. 2*).—This leaflet summarizes procedures to be used in freezing different kinds of fruits and vegetables.

Influence of freezing on tenderness in "aged" beef, R. W. BRAY, G. E. VAIL, and D. L. MACKINTOSH. (Kans. Expt. Sta.) (*Kans. Acad. Sci. Trans., 44 (1941), pp. 327-331, figs. 3*).—The beef for this study was obtained from four Hereford steers weighing about 700 lb. The carcasses from the two animals grading U. S. Good were aged for 32 days, while those from the other two animals, grading U. S. Medium, were aged for 42 days. Steaks $1\frac{1}{2}$ in. thick were cut from the short loin cut, eight steaks, beginning at the anterior end, being cut from each loin, four of which represented the anterior portion and four the posterior portion. Alternate steaks from paired right and left loins were wrapped in a moisture-, vapor-proof paper and frozen at from -10° to -15° F. Within 24 hr. after slaughter, control steaks were cooked, by a method effecting uniform cooking, and tested for tenderness by the Warner-Bratzler

tenderness shear test applied to lateral, central, and medial cores cut from the steaks. Frozen steaks, thawed at 34°–38°, were similarly cooked and tested. The tenderness data, analyzed statistically, indicated that there was little or no change in tenderness of aged beef due to freezing, but that this might vary with the animal. Considerable variation was found in the tenderness between animals and among the cores taken from the steaks (longissimus dorsi muscle). The greatest variation occurred in the lateral core. The posterior section of the short loin was found to be more tender than the anterior section, and the right side significantly more tender than the left side.

The effect of the rate of freezing and temperature of storage on the quality of frozen poultry, C. W. DuBois, D. K. Treessler, and F. Fenton. (N. Y. State Expt. Sta.). (*Refrig. Engin.*, 44 (1942), No. 2, pp. 93–99, figs. 13).—Drawn roasting chickens, packaged by wrapping in moistureproof Cellophane and inserting in a stocknet, were frozen with and without air blast at +10°, 0°, –8°, and –25° F.; some were also frozen in a Birdseye multiplate freezer. The drop in temperature during freezing, as measured by thermocouple and plotted as freezing curves, showed that the time required for freezing at any given temperature was reduced by approximately one-half when the fan was used, and that the birds frozen in the Birdseye multiplate freezer were frozen in a much shorter time than those in an air blast at this temperature. Frozen sections of the muscle tissues were prepared for microscopic examination. The photomicrographs showed that as the rate at which the chickens were frozen increased the less was the break-down of the muscle fibers; those that were frozen more slowly showed more disruption. In palatability studies of the chickens after thawing and roasting it was found that, with one exception, the birds frozen rapidly rated higher than those frozen more slowly. All of the roasted chickens were of good quality, however, and there was scarcely any difference in flavor, aroma, and texture between the two extremes of the series.

Other chickens were drawn, packaged in four different materials, rapidly frozen, and then stored at +15°, +10°, 0°, and –8°. Flavor changes were noted sooner in chickens packaged in the waxed paper, which had a high moisture-vapor transmission rate, than in those packaged in more moisture-vapor-proof materials. Likewise, moisture losses of chickens packaged in the waxed paper and stored at 0° amounted to 4.7 and 6.4 percent in 12 and 20 mo., respectively, as compared with very slight losses by chickens packaged in moisture-vapor-proof viscose sheets or in rubber latex. The internal fat, as judged by peroxide values and organoleptic tests, turned rancid more quickly than did the external fat. In the former rancidity was noted after 5, 10, and 18 mo. of storage at 15° and 10°, 0°, and –8°, respectively.

Meat in nutrition.—XXI, Distribution and partition of fats in certain tissues of rats fed a diet containing dried autoclaved pork muscle, E. B. Wilcox. (Iowa State Col.). (*Iowa State Col. Jour. Sci.*, 17 (1942), No. 1, pp. 158–160).—A supposedly adequate diet containing dried autoclaved pork muscle had been shown to produce a pregnancy disorder at parturition in about one-third of the animals maintained on the ration (E. S. R., 85, p. 268). Pregnant and virgin rats on this experimental diet were observed in the present study in comparison with corresponding normal animals on the stock diet as a control. Pregnancy per se in the normal animal brought about an increase in liver weight. This increase was also observed in the pregnant animals on the experimental ration. These rats showed in addition a dehydration of the liver tissue and an increase in its fat content greater than that occurring in the virgin or in the normal pregnant rat; this condition was not changed in the pregnant rats

exhibiting toxemia. The livers of pork-fed pregnant rats showed, in comparison with livers of normal gravid animals, an increase in neutral fat and cholesterol esters accompanied by a reduction in free cholesterol; toxemia did not change this picture. Total fatty acids, phospholipides, and total cholesterol in the plasma of pregnant controls were each about twice as high as these fractions in the plasma of pregnant experimental animals. An investigation of the liver lipides of a group of toxemic females fed the basal pork diet showed, however, that about half of these animals had livers normal with respect to fat. These various findings are interpreted as indicating that fat metabolism is altered in the pregnant rat following the feeding of a diet containing dried autoclaved pork muscle, but that the development of a fatty liver is not a basic cause of the pregnancy disease that so frequently occurs in rats maintained on this ration.

Digestion characteristics of various types of milk compared with human milk, F. J. DOAN and J. L. DIZIKE. (Pa. Expt. Sta.). (*Milk Plant Mo.*, 31 (1942), No. 9, pp. 24-28, 44, fig. 1).—An abstract of the study noted previously (E. S. R., 88, p. 127).

Making fruit and vegetable juices in small lots (*Farm Res.* [New York State Sta.], 8 (1942), No. 4, pp. 6-7, figs. 3).—Essentially noted from another source (E. S. R., 88, p. 129).

Vegetable juices present special problems, H. G. BEATTIE and C. S. PEDERSON (*Farm Res.* [New York State Sta.], 8 (1942), No. 4, pp. 10-11, fig. 1).—Essentially noted from another source (E. S. R., 88, p. 129).

Experiments on concentrated food bars, W. V. CRUESS, H. F. FRIMM, and C. SUMNER. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 12, pp. 359-360, 379, 380).—The authors point out a need for two types of concentrated food bars of the customary 5-ct. candy bar size and appearance but better balanced nutritionally, one being a bar high in protein, mineral elements, and calories, the second a bar in which dried fruits predominate, it, too, being of high caloric value and basic ash minerals as well as rich in sugars. Such bars are needed as military and other emergency rations, and the authors believe, also, that they may be made sufficiently attractive in flavor and appearance to have general salability. Recipes for nine such mixtures are given and procedure for the preparation of the bars is discussed, together with the general requirements with respect to the components and the mixture as a whole.

Fruit bar for Army K ration, W. V. CRUESS and J. LA MOGLIA. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 22 (1942), No. 1, p. 13).—General specifications and several formulas are noted for the preparation of fruit bars for possible inclusion in Army emergency field rations. Fondant, chocolate, nuts, etc., are omitted. Honey, invert sugar sirup, or glycerine are added to prevent hardening or drying out in the field. Moisture content is kept between 14 and 20 percent in order for the bars to remain edible in texture at 0° or 130° F. Pasteurization when packed and fumigation in storage are recommended for insect control.

Fruit bars for Yanks, W. V. CRUESS and J. LA MOGLIA. (Univ. Calif.). (*Canner*, 95 (1942), No. 14, p. 13).—Noted above.

Natural foods in the American dietary, C. A. ELVEHJEM. (Univ. Wis.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 5, pp. 279-284).—This paper, presented as the first Mary Swartz Rose Memorial Lecture before the Greater New York Dietetic Association February 3, 1942, stresses two points—"first, the necessity of more accurate information regarding the distribution of essential nutrients in all foods; and, second, a more careful consideration of the type of educational

and promotional methods used to induce the entire public to believe that improved nutrition pays dividends."

A short method for dietary analysis, E. G. DONELSON and J. M. LEICHSEN-
RING. (Minn. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 7, pp. 429-434).—The proposed short method is based on the use of representative mean values for the composition of food groups. The means, derived from the values for foods most commonly occurring in a series of dietaries used in the North Central region of the United States, were weighted in accordance with the frequency with which certain foods occurred in the dietaries. It is suggested that some modification may be required to adapt the method to regions in which the typical diet differs appreciably from that in the locality studied. Results obtained by this short method compared favorably with those computed by the usual long method. Statistical analysis showed the differences between results by the two methods to be statistically insignificant whether computations were based on food records for a week or for only a day, although the degree of concurrence was higher when weekly records were available. The results by the short method agreed most closely with those by the long method when a varied diet was used and when only foods of known composition were included. A food composition table showing the calories, protein, minerals, and vitamins per serving (or measure) for each group or subgroup of foods is presented for use in the short method.

An experience with low-cost diets, J. WHITACRE. (Tex. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 5, pp. 285-294).—Low-cost menus for three meals daily for a weekly period are presented according to six different diet plans, each of which was directed toward attaining nutritional adequacy. Schedules are presented showing costs and amounts of the various foods and the nutritional values attained. The meals as planned cost from about 12.5 to 18.5 ct. per day and, as actually served to regular members of diet groups, illustrated that really good low-cost diets may be achieved in a way that is teachable.

The caloric intakes of twenty-seven college women, M. S. PITTMAN, H. MCKAY, B. L. KUNERTH, M. B. PATTON, N. EDELBUTE, and G. COX. (Kans. and Ohio Expt. Stas. and Kans. State Col.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 7, pp. 449-453).—This report, presented as paper No. 9 of the regional project of the North Central States relating to the nutritional status of college women, presents data on the caloric intakes of the same 27 subjects (12 Kansas and 15 Ohio) whose mineral intakes were previously discussed (E. S. R., 87, p. 452). The subjects, on diets freely chosen as to calories, were studied over periods ranging from 7 to 67 days, their caloric intakes being determined by analysis of aliquots of the food eaten. The mean caloric intakes of the different subjects were found to vary greatly, ranging from 27.6 to 56.4 calories per kilogram per day for Kansas subjects, a difference of 104 percent, and from 19.9 to 50.0 calories per kilogram for Ohio subjects, a difference of 151 percent. These differences between subjects were significantly greater than differences between periods for the same subject. The mean intake for all subjects from Kansas for all periods was 39.3 calories per kilogram per day and 32.8 for all Ohio subjects, or 35.7 for the two States combined. The mean caloric intake for the subjects from both States, individually and collectively, was well below the commonly used standard for moderately active women (about 43 calories per kilogram as estimated on the basis of 2,400 calories daily for the average woman of 56 kg.) and still lower than the standard (2,500 calories daily) proposed for the average woman by the Committee on Food and Nutrition of the National Research Council.

Good nutrition important for older school children, L. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 9, p. 1).—In a study conducted in

five schools in one Mississippi county, it was found that relatively more of the children over 13 yr. of age were underweight for their height and age and more frequently showed defects of posture, hearing, and vision than in the case of the younger children. These findings suggested that more attention than was customary should be given to the food consumption of adolescents and that they should be guided in food selection for adequate nourishment.

Preliminary findings of the Virginia nutrition study: First seasonal survey, W. H. RONEY, M. S. EHEART, and G. PARKER (*Virginia Sta., Rural Sociol. Rpt. 20 (1941), pp. [2]+15, fig. 1*).—This study (Nutrition Report 1) was initiated to obtain more exact information concerning food habits and nutrition conditions of Virginia people, with the ultimate aim of providing, through the findings, a more practical basis for State action agencies and programs concerned with the improvement of nutrition and health on a specific local basis, as well as on a general State-wide basis. The study is sponsored by the Virginia State Nutrition Committee in cooperation with the following agencies: State Department of Education, Virginia Polytechnic Institute, Virginia Home Demonstration Service, Virginia State Planning Board, National Youth Administration for Virginia, Work Projects Administration, and the station.

The study comprises three seasonal surveys of the diets of school children from the fifth to the tenth grades. The first survey, taken in April and May, 1941 and embracing about 5,700 white and Negro children of both county and city schools, is described and summarized in the present report. This considers particularly the general picture of the total diet in protective foods in the State, in individual regions, and in individual school communities, and the diet adequacy in specific protective foods. In general, it appears that the total rural and urban children of both races (white and Negro) were getting an average of only approximately two-thirds of the amount of all protective foods (excluding butter and cream) recommended by nutrition standards. Contrasting rural and urban children, it appears that for both racial groups the urban children were the better nourished. For all regions and races combined, the diet adequacy of children in families producing their own milk was approximately 10 percent higher than in the case of families purchasing the milk. Similarly, children whose families reported the use of greater varieties of home-grown vegetables showed higher adequacy ratings for vegetables.

The Virginia nutrition study: A progress report, W. H. RONEY, M. S. EHEART, and G. PARKER (*Virginia Sta., Rural Sociol. Rpt. 22 (1942), pp. [2]+7*).—This report (Nutrition Report 2) comprises a brief summary of the April and May survey, noted above, and the October and November 1941 survey, involving about 4,700 children from the sixth to the eleventh grades in rural and city schools. The nutritional ratings as to adequacy in all major protective food classes (vegetables, fruits, and tomatoes; meats; milk and milk products) showed relatively little improvement in the fall, in spite of the greater supply of vegetables and fruits as compared to the supply in early spring, except for slight improvement in the rural Negro children in the eastern southside region. The improvement in this group was probably due to larger wage incomes. As revealed in the fall survey, the influence of the economic level of families on the diet adequacy was highly significant in the rural group. The nonfarm group as a whole showed slightly higher adequacy than the farm group, doubtless because of the higher cash incomes of the nonfarm people. Farm owners were somewhat higher in their diet adequacy rating than tenants and laborers combined. The professional and business groups ranked highest, while unskilled labor and domestic service groups ranked lowest. In the urban group the professional and business groups also ranked highest, followed by the skilled and the semiskilled groups.

Although the urban professional group was at the top of the economic ladder, the children of this group received less than three-fourths of the recommended nutritional standard. For both races of children in both rural and urban groups in all regions, the major food classes ranked as follows in order of decreasing percentage of adequacy: (1) Meat, (2) fruit, (3) milk and milk products, (4) vegetables, and (5) whole-grain cereals.

Food for health in Hawaii, C. D. MILLER and H. Y. LIND (*Hawaii Sta. Bul.* 88 (1942), pp. 84, figs. 23).—This publication, written in popular style, presents notes on choosing foods and planning meals for nutritional adequacy, with recipes and menus.

Relation of multiple dietary deficiencies to hypochromic anemia. (Univ. Nebr.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 3, pp. 160-161).—This editorial, essentially an abstract of an address by R. M. Leverton, is based on studies noted previously (*E. S. R.*, 86, p. 419).

The contribution of amino-acids to normal nutrition, H. H. MITCHELL. (Univ. Ill.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 3, pp. 137-140).—An address.

Effect of apples, tomatoes, and dates on urinary acidity and blood alkali reserve, K. G. SHEA and C. R. FELLERS. (Mass. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 7, pp. 454-457).—Of the nine young men who served as subjects in these tests, four received a basal diet which was approximately neutral and five a diet that was slightly acid-forming. During the test periods in which they received Baldwin and McIntosh apples ingested in 800- and 1,000-gm. amounts, all subjects behaved similarly. Both varieties of apples slightly lowered the pH of the urine, but did not significantly affect the blood alkali reserve. About 90 percent of the organic acids of the apples was completely oxidized or otherwise transformed in either the acid-forming or the neutral diets. The two basal diets gave similar results insofar as acid and ammonia excretion in urine and blood alkali reserve were concerned. Tomatoes (800- and 1,000-gm. amounts) and dates (400-gm. portions) had practically no effect on the composition of the urine or on the blood alkali reserve. Again the neutral and acid-forming diets gave closely similar results. In spite of the high alkalinity of the ash of dates, the pH of the urine was not increased and the organic acids were not decreased. Data are reported on the proximate chemical composition of the McIntosh and Baldwin apples, tomatoes, and dates.

The effect of lemon juice on calcium retention, M. G. MALLON and D. J. LORD. (Univ. Calif.). (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 5, pp. 303-305).—Ten litter-mate female rats were placed at 28 days on a basal diet composed of 1 part powdered whole milk and 5 parts whole-wheat flour (and containing 0.166 percent Ca.). Half of the animals also received 5 cc. of lemon juice daily. At 60 days the Ca retention of these animals, determined by carcass analysis and with due allowance for the Ca content at 28 days, compared very favorably with the Ca retention of the litter-mate controls on only the basal diet. The lemon juice had not, apparently, affected the calcium retention.

Effect of manganese on calcification in the growing rat, C. CHORNOCK, N. B. GUERRANT, and R. A. DUTCHER. (Pa. State Col.). (*Jour. Nutr.*, 23 (1942), No. 5, pp. 445-458, figs. 2).—In the high-manganese diets used manganese carbonate molecularly supplemented or replaced the calcium carbonate of the basal rachitogenic diet, the resulting diets varying in Mn content from 0.312 to 1.73 percent. In the low-Mn diets the basal diet was supplemented with 0.006 and 0.01 percent Mn added as the carbonate, or the supplementation was effected by subcutaneous injection of manganese lactate in amounts equivalent to those consumed in the rations. On the high-Mn intakes the growth of the

rats was retarded in proportion to the amount of Mn in the diet, and the excretion of P was increased in all cases and that of Ca was increased at the highest Mn levels. In some cases this fecal excretion of Ca and P was sufficient to deplete the body supply of these elements. The effect was less marked when the Ca in the diet was replaced than when it was supplemented by Mn except with complete replacement of Ca, in which case results were fatal because of the severe loss of Ca and P from the body. A more favorable Ca:P ratio in the diet, produced by increasing the P content, tended to improve the retention of Ca and P even in the presence of Mn. Rats fed large amounts of Mn developed severe rickets, as evidenced by the low serum P level and by the condition of the bones. With the levels of Mn that produced negative P balances, the Ca and P were drained from both bones and other tissues and the rickets was apparently complicated with osteoporosis. Administration of vitamin D resulted in an improved condition. The addition of potassium citrate to the diet also produced a striking improvement in Ca and P retention and subsequently in bone calcification. Mn was stored chiefly in the liver. Injected Mn was largely excreted in the feces, but some was stored in the liver and the bones. Low-Mn intakes did not retard growth and showed little or no effect on bone calcification either in conjunction with normal or with rachitogenic diets.

Studies on manganese deficiency in the rat, P. D. BOYER, J. H. SHAW, and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 177-125, figs. 2).—Pronounced Mn deficiency was produced in rats weaned without access to Mn by placing the pregnant female on a low-Mn ration during the last few days of gestation and during the suckling period. Of the two Mn rations used, the mineralized milk (1 mg. of Fe and 0.1 mg. of Cu per 100 cc. of milk) containing about 0.03 p. p. m. of Mn produced a greater retardation of growth than did the solid ration containing about 2 p. p. m. Mn supplementation, bringing the Mn in the milk to a concentration of 10 p. p. m. and in the dry ration to 50 p. p. m., effected a definite growth response in both the male and the female rats. "In the Mn-deficient female rat oestrous cycles were irregular or absent, and there was a marked delay in the opening of the vaginal orifice. A Mn deficiency in the male rat caused testicular degeneration and complete sterility due to lack of spermatozoa production. Both male and female Mn-deficient rats were unable to reproduce. No histological abnormalities were detected in the adrenal, kidney, pituitary, and thyroid of the Mn-deficient rat." The Mn deficiency did not result in reduced ascorbic acid content of tissues, since kidney, liver, adrenal, and testis of the deficient animals showed essentially the same ascorbic acid content as corresponding tissues from normal animals. Ascorbic acid, equivalent to 10 mg. per rat per day, administered to Mn-deficient animals for a period of 30 weeks did not stimulate the growth of these animals. In vitro synthesis of ascorbic acid from mannose could not be obtained by rat liver, kidney, intestine, or spleen with or without the addition of Mn. These results are interpreted to indicate that there is no relation between Mn and ascorbic acid synthesis. A reduced arginase concentration in the liver of the Mn-deficient rat was found, but there were no essential differences in the activity of the intestinal dipeptidases studied.

Hematologic standards for healthy newborn infants: Erythrocyte count, hemoglobin content, cell volume, color index, volume index, and saturation index, E. G. CHUINARD, E. E. OSGOOD, and D. M. ELLIS (*Amer. Jour. Diseases Children*, 62 (1941), No. 6, pp. 1188-1196, figs. 2).—This article, one of a series giving hematologic standards for normal persons from birth throughout adult life, reports the results of determinations on oxalated fontanel blood of 195

infants, about 10 of each sex being studied on each of the first 10 days of life. No significant differences with age or sex were noted during this age period. "The average erythrocyte count was 4,600,000 cells per cubic millimeter, with an extreme range from 2,600,000 to 6,300,000. . . . The average hemoglobin concentration was 16.3 gm. per 100 cc., with an extreme range from 10.3 to 22.6 gm. . . . The average packed red cell volume 43.4 cc. per 100 cc. of blood, with an extreme range from 25.5 to 61.0 cc. . . . The average hemoglobin coefficient was 17.8, with an extreme range from 1.25 to 23.5. . . . These results correspond to an average color index of 1.00, with a range from 0.78 to 1.23. The average volume coefficient was 47.6, with an extreme range from 34 to 61. . . . The average saturation index was 1.00, with an extreme range from 0.77 to 1.46; 95 percent of the values fell in the range from 0.85 to 1.15. The cells of newborn infants are larger and contain more hemoglobin than those of older persons, but the corpuscular hemoglobin concentration is similar to that of adult men. Hemoglobin content should be reported in terms of grams per 100 cc. of blood; for the calculation of color, volume, and saturation indexes, standards for healthy persons of the patient's sex and age group must be used."

The absorption and excretion of 'minor' elements by man.—H. COBALT, nickel, tin, and manganese, N. L. KENT and R. A. McCANCE (*Biochem. Jour.*, 35 (1941), No. 8-9, pp. 877-883).—This study, carried out in the same manner as the work noted in part 1 (E. S. R., 87, p. 748), involved metabolism experiments on men and women combined with intravenous injection of Co, Ni, Sn, and Mn salts. One man during a 7-day test period excreted about 20 percent of his food Co in the urine; in the following week in which a total of 13 mg. of Co was injected intravenously, only 2.89 mg. was excreted, 74 percent by the kidneys. From 60 to 70 percent of food Ni ingested by two men in the test period was excreted in the urine; injected Ni (9 or 20 mg. in a week) was, like the cobalt, excreted slowly and rather incompletely, mainly by the kidneys. Two men excreted from 50 to 80 percent of their food Sn in the urine; in subsequent periods when Sn was injected, from 60 to 70 percent of the amount administered was recovered, most of this Sn being excreted by the kidney. Only a very small part of the Mn in the food was excreted in the urine, and there was no increase even after intravenous injections of Mn salts. Two persons retained the whole of the injected Mn, while a third excreted about 50 percent by the bowel.

Choline metabolism, VII, VIII (*Jour. Nutr.*, 21 (1941), No. 6, pp. 633-646, fig. 1; 23 (1942), No. 1, pp. 91-100, figs. 4).—A continuation of the series, some papers of which have been noted (E. S. R., 86, p. 859).

VII. Some dietary factors affecting the incidence and severity of hemorrhagic degeneration in young rats. W. H. Griffith and D. J. Mulford.—It has been shown that hemorrhagic degeneration produced in young rats by diets low in choline and in labile methyl food mixture is accompanied by loss in weight and spectacular rise in nonprotein nitrogen of the blood at the critical stage of the hemorrhagic state, followed by gains during the period of spontaneous recovery, if this occurs. Restriction of food intake results in protection against the renal lesions developing on the same diet fed ad libitum. Dietary supplements of cholesterol produce injurious effects within from 30 to 40 days even on diets containing more than the amount of choline required for complete protection during the critical 8-day period. Supplements of thiamin, riboflavin, pyridoxin, calcium pantothenate, ascorbic acid, vitamin K, and "vitamin P" do not affect the severity of the results of labile methyl deficiency, but nicotinic acid exerts a moderate choline-opposing action.

VIII. The relation of cystine and of methionine to the requirement of choline in young rats. D. J. Mulford and W. H. Griffith.—Experiments are reported which

are interpreted as demonstrating that the 18-percent casein diet is a suboptimal source of cystine for the young rat, inasmuch as growth and efficiency of food utilization are improved by supplementary cystine (0.1-0.2 percent). Such additions, however, increase the deposition of liver fat and the incidence of renal hemorrhagic degeneration if the diet is low in choline and necessitate the addition of choline. In the absence of dietary choline 30 percent of casein is required to supply sufficient methionine and cystine to prevent signs of choline and cystine deficiency. It is considered that the needed methionine is not utilisable as a source of cystine sulfur.

The significance of the ratio of lactic to pyruvic acid in the blood after exercise, T. E. FRIEDMAN and C. J. BABORKA (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 993-994, fig. 1).—Attention is called to observations of previous workers that the concentration of pyruvic acid in the blood increases greatly after muscular exercise and then decreases as the lactic acid returns to normal. Experiments by the authors are presented showing that the pyruvic acid rises and falls logarithmically, or nearly so, with time, and following severe muscular exertion the early extremely high ratio of lactic acid to pyruvic acid falls rapidly during the first few minutes and then decreases slowly, with the point of inflection of the curve occurring at from 4 to 10 min., depending upon the severity of the exercise. It is considered of special interest that it is at this time that the pulse, respiration, oxygen intake, and oxygen content of the blood are rapidly returning to normal. The belief is expressed that the ratio of lactic to pyruvic acid is an indication of returning normal oxidative conditions.

Removal of pyruvic acid from human blood in vitro, E. BURDING and R. GOODHART (*Jour. Biol. Chem.*, 141 (1941), No. 3, pp. 931-944).—In continuation of studies of pyruvic acid in the blood (E. S. R., 85, p. 852), evidence is presented that defibrinated, heparinized, citrated, and oxalated human bloods are capable of removing added pyruvate in vitro. The removal is shown to begin immediately upon withdrawal of the blood and to continue at an increasing rate for the first 30 min. The removal from whole blood is increased by incubation with 0.075 M phosphate, with optimum pH at 7.4, and is not affected by the addition of thiamin, cocarboxylase, and glucose or by the oxygen tension of the blood. In the presence of 2 percent of fluoride, from 83 to 95 percent of the pyruvic acid removed can be recovered as lactic acid. Experiments with whole blood, plasma, and washed blood cells showed that the enzyme system responsible for the removal of pyruvate by blood is heat labile and is located within the blood cells. The plasma contains a heat-stable activator of the enzymatic reaction which appears to be a phosphorylated intermediary of carbohydrate catabolism, probably triose phosphate. The evidence is thought to indicate an analogy between the mechanism for the anaerobic removal of pyruvate in blood and in muscle.

The effect of pyridoxine on the urinary excretion of a new fluorescent substance, S. A. SINGAL and V. P. SYDENSTRICKER. (Univ. Ga.). (*Science*, 94 (1941), No. 2449, p. 545).—A four- to tenfold increase in the bluish-purple fluorescence of urines of normal persons or pellagrous patients was noted following ingestion of 100 mg. of pyridoxin hydrochloride as compared with the preceding control period. The urinary substance responsible for this fluorescence resembled the F_1 described by Najjar and Wood (E. S. R., 85, p. 702) in its adsorption on permutite, elution with 25 percent KCl, and extraction from the eluate with isobutanol, but differed from F_1 in that it was extracted from only the untreated eluate. The presence of the unknown substance could not be demonstrated in in vitro tests with pyridoxin either alone or incubated with

urine. These results indicated that it might be a new entity and perhaps of significance in the intermediary metabolism of pyridoxin.

Chemistry and physiology of the vitamins, H. R. ROSENBERG (*New York: Interscience Pubs., Inc., 1942, pp. XIX+674, figs. 25*).—This monograph, presenting a comprehensive up-to-date treatment of the chemistry and physiology of the vitamins, represents the work of a decade in a very thorough compilation of the literature covering all topics of vitamin research. The book begins with a definition of the vitamins which distinguishes this group of compounds sharply from the hormones and from other essential and nonessential food constituents, and continues with a new classification for compounds which act as vitamins and at the same time serve as structural building units or suppliers of energy. Each vitamin is then discussed separately, with a review of the nomenclature, a tabulation of the historical development, a paragraph on the occurrence, and the main discussion dealing with the chemistry and physiology of the vitamins. Under chemistry, consideration is given to the following topics: Procedures used for the isolation of the vitamin; proof of its constitution; its synthesis; industrial methods of preparation; biogenesis; specificity of action; methods of determination, including physical, chemical, and biological methods; and vitamin standards. "The physiology of plants and micro-organisms is separated from the animal physiology, which is subdivided into the metabolism of the vitamin, the physiological action, and the mechanism of the vitamin action. The relation of each vitamin to other vitamins, to hormones, and to inorganics is presented in special paragraphs. This is followed by a short review of the present-day knowledge of the pathological aspects, the hypovitaminoses, avitaminoses, hypervitaminoses, and paravitaminoses, with a special section on clinical test methods. Finally, the vitamin requirements are briefly stated. The book ends with a list and abstracts of vitamin patents which have issued in the United States of America, Great Britain, Germany, and France."

Ueber den Vitamingehalt fertiger Speisen [The vitamin content of prepared foods], H. WILLSTAEDT (*Ztschr. Vitaminforsch., 11 (1941), No. 4, pp. 340-361; Fr., Eng. abs. pp. 360-361*).—About 100 foods, as prepared in the home or for restaurant service (Uppsala, Sweden) were analyzed, by methods noted, for one or more of the following constituents: Vitamin A, total carotenoids, α - and β -carotene, thiamin, riboflavin, nicotinic acid, and ascorbic acid. Soups; hors d'oeuvres; egg, fish, meat, and vegetable dishes; desserts; and beverages were included among the foods analyzed.

Meat and human health, C. A. ELVEHJEM. (Univ. Wis.). (*Jour. Amer. Dietet. Assoc., 18 (1942), No. 3, pp. 145-148*).—This address gives attention to the importance of meat as a source of vitamins, particularly those of the B complex.

Vitamin A value of fresh and dehydrated carrots, R. H. WILSON, J. O. THOMAS, and F. DEEDS. (U. S. D. A. et al.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 22 (1942), No. 1, pp. 15-17, 27, figs. 3*).—Carrots of the Chantanay variety were used in this study. The dehydrated product was prepared from the fresh carrots, scraped, cubed, and blanched in steam for 2 min., by drying for 7 hr., the initial temperature being 161° F. dry bulb and 85° wet bulb, and the final temperature 140° dry bulb and 83° wet bulb. Combined α - and β -carotene was determined on both the fresh and the dehydrated carrots by a modification of the chromatographic adsorption method of Moore (E. S. R., 85, p. 583). These determinations were paralleled by bio-assays of vitamin A, using the same representative samples of the fresh and dehydrated carrots throughout the whole bio-assay period. The samples were stored under nitrogen throughout the test period, the fresh carrots in addition being kept at 5° C.

in small lots, each sufficient for a week's feeding. The assay procedure, described fully, involved determination of the response, as evaluated by growth and improvement in eye condition, of vitamin A-deficient rats fed supplements of the fresh or dehydrated carrots in comparison with the response of rats fed supplements, at two levels, of a pure carotene preparation. The fresh carrots were found to contain 87.7 percent of water and by chemical analysis 101 γ of total carotene per gram (820 γ per gram, dry basis); by the animal assay procedure they were found to contain the biological equivalent of $123 \pm 10\gamma$ per gram. The dehydrated carrots, with a moisture content of 6.6 percent, contained 722 γ of carotene per gram (773 γ per gram, dry basis) according to the chemical analysis and the biological equivalent of $702 \pm 64\gamma$ per gram. These results indicate close agreement between the chemically determined value for carotene and the bio-assay value of provitamin A as obtained by the procedure described. The results also show that carrots dehydrated under the particular conditions employed lost but little of their provitamin A content during dehydration.

Vitamin A and ascorbic acid in pulmonary tuberculosis: Determination in plasma by the photoelectric colorimeter, H. R. GETZ and T. A. KOERNER (*Amer. Jour. Med. Sci.*, 202 (1941), No. 6, pp. 831-847, figs. 8).—Among the comparisons noted in this study of the plasma vitamin A and ascorbic acid values in presumably normal individuals (staff members) and nontuberculous and tuberculous patients (some immediately following diagnosis and others who had been receiving treatment) in a Philadelphia chest clinic serving both Negro and white populations, with many of both races on public assistance, are the following:

The plasma vitamin A levels in tuberculous patients decreased in proportion to the extent of tuberculous involvement. This was also true of the ascorbic acid which approached prescorbutic levels with advanced tuberculosis. Non-tuberculous, as well as tuberculous, patients were malnourished in both vitamins A and C. The patients under treatment had higher levels of both vitamins than those just diagnosed. Females of both races had lower A and higher C values than males, and there was no age difference in the A values. Negroes in general had lower values of both A and C than the white subjects.

The comparative value of the blood plasma vitamin A concentration and the dark adaptation as a criterion of vitamin A deficiency, O. BODANSKY, J. M. LEWIS, and C. HAIG (*Science*, 94 (1941), No. 2442, pp. 370-371).—A series of comparisons of blood plasma levels of vitamin A and dark adaptation tests on varied intakes of the vitamin is reported, with the conclusion that the plasma vitamin A concentration is a considerably more sensitive indicator of vitamin A deficiency than is the dark adaptation test.

The mean plasma vitamin A value for 46 infants from 3 weeks to 6 mo. of age receiving from 1,200 to 1,500 International Units of vitamin A was 74 I. U. per 100 cc. and for 47 infants of the same age receiving 17,000 I. U. daily was 93 I. U. per 100 cc. In no case did the value fall below 45 I. U. No differences between the two groups were found in dark adaptation readings. In a group of infants kept for from 2 to 4 mo. on diets furnishing only about 335 I. U. of vitamin A daily, the plasma values fell by from 4 to 23 units with no increase in dark adaptation. In another group of 12 infants who were kept for periods of from 2 weeks to 4½ mo. on a diet devoid of vitamin A the plasma values of 7 fell below 45 units, and the subjects showed abnormal dark adaptation. When 5 were given 150 I. U. of vitamin A daily for 1 mo., the dark adaptation became normal in every case, though the plasma concentration remained low.

The mean value for 19 normal children from 6 to 12 yr. of age was 117 I. U. per 100 cc., with a range of from 70 to 197, and all of the subjects had normal

dark adaptation. In a group of 118 children of the same age hospitalized for various conditions, including malnutrition, the mean plasma vitamin A value was 89 and the range from 25 to 198 I. U., with values below the designated normal of 67 I. U. for children of that age in 22 cases. Only one of the entire group showed abnormal dark adaptation.

Dark adaptation and vitamin A: Further studies with the biophotometer, P. C. JEANS, E. L. BLANCHARD, and F. E. SATTERTHWAITE (*Jour. Ped.*, 18 (1941), No. 2, pp. 170-194, figs. 11).—Further observations with the biophotometer as an instrument for determining dark adaptation as a measure of vitamin A deficiency (E. S. R., 77, p. 886) are reported, with a critical discussion of the inconsistent results reported by some investigators.

"Evidence is presented that the results obtained with this instrument are consistent from test to test of the same subjects and correspond with the vitamin A status of those subjects, when the technic employed is satisfactory and when certain interpretations are applied. By mathematical analysis of the results, the technic described in 1937 has been shown to be satisfactory. Reports of inconsistent results by other observers have been reinterpreted in the light of our own experience, with the conclusion that the apparent inconsistencies have a logical explanation in variability of the status of the subject rather than in fallibility of the test. Normal subjects with ample vitamin A intake, while remaining in good health, have normal test results at all times. The subjects of our observation group who had poor dark adaptation and who submitted to therapy attained normal adaptation in all instances while receiving vitamin A. Three subjects receiving an experimental diet of low vitamin A content showed changes in dark adaptation ability paralleling the depletion of this material and later repletion."

In the authors' experience dietary deficiency alone appeared to be the cause of impaired dark adaptation in only a few instances. The most common cause was thought to be a deficiency in utilization of vitamin A resulting from illness, especially infections. Seasonal differences in incidence are thought to be related more closely to seasonal variations in infection than in diet.

A comparison of two methods of measuring dark adaptation, R. E. ECKHARDT and L. V. JOHNSON (*Jour. Ped.*, 18 (1941), No. 2, pp. 195-199, figs. 2).—From results of repeated dark-adaptation tests on the same subject with the biophotometer and the Hecht adaptometer, the authors conclude that as usually conducted the light used for bleaching in the biophotometer test is not bright enough, with the result that cone adaptation is absent. When the intensity of the bleaching light is sufficiently increased, the cone adaptation can be measured with the biophotometer. The first reading obtained after the bleaching period with the biophotometer is thought to represent the final cone threshold obtained with the adaptometer. Within the limits of error, rod adaptation was found to be identical with both instruments. Continued use of the biophotometer in the study of vitamin A deficiency is thought to be valid, and it is suggested that measurements of dark adaptation be continued for 15 or 20 min. following the bleaching period.

Cure of egg-white injury in rats by the "toxic" fraction (avidin) of egg white given parenterally, P. GYÖRGY and C. S. ROSE (*Science*, 94 (1941), No. 2437, pp. 261-262).—In the experiments reported here avidin concentrates mixed with the food proved toxic, but parenterally they were nontoxic and even permitted improvement in the manifestations of egg-white injury when cooked egg white was substituted for commercial egg white in the diet. The explanation offered for this paradox is that the avidin concentrates contained not only free avidin but also bound biotin. This compound of biotin was stable under conditions prevailing in the intestine so that the biotin remained

effectively inactivated, whereas a split occurred in the parenteral medium liberating the concealed biotin, which then acted therapeutically.

On the porphyrin nature of the fluorescent "blood caked" whiskers of pantothenic acid deficient rats, L. W. McELROY, K. SALOMON, F. H. J. FIGGE, and G. R. COWGILL (*Science*, 94 (1941), No. 2446, p. 467).—The reddish material observed around the nose and on the whiskers of rats on a pantothenic acid-deficient diet, a condition described by Daft and Sebrell (*E. S. R.*, 83, p. 139) as nosebleed and by Unna (*E. S. R.*, 86, p. 423) as blood-caked whiskers, has been found to contain a large proportion of coproporphyrin shown to be derived from the Harderian gland. Attention is called to the report of Chick, Macrae, and Worden (*E. S. R.*, 85, p. 856) in which the material was designated as a protoporphyrin.

Dietary requirements for fertility and lactation.—V, The lactation-promoting properties of cystine when added to casein diets. VI, Quantitative requirements of various components of the vitamin B complex for lactation. VII, The existence of a new dietary factor essential for lactation, B. SURE (*Arkansas Sta. Bul.* 425 (1942), pp. 34).—In continuation of the series of bulletins on the general subject of dietary requirements for fertility and lactation (*E. S. R.*, 69, p. 760), the present publication submits recent findings on three phases of the investigation. Parts V and VII have been essentially reported (but with less detail) in another source (*E. S. R.*, 87, p. 592). The quantitative requirements discussed in part VI were determined following the depletion of reserves of the vitamin B complex of female rats with litters transferred from an optimal stock diet to a highly purified experimental diet. For rearing of the young to proceed normally, it was found necessary to furnish the mother with the following daily vitamin supplements: "120 μ g. B₁ (thiamin), 120 μ g. riboflavin, 50 μ g. B₆, 15 mg. choline chloride, 1 cc. of a solution of 'W' factor equivalent to 1 gm. of liver extracts, and 6 mg. niacin. It was not determined whether the niacin is essential for the lactating rat. By such procedure of transfer experiments it is, of course, possible that there was still storage of unidentified components of the vitamin B complex essential for lactation from the previous stock diet. Choline was found to be an indispensable component of the vitamin B complex for growth and lactation of the albino rat."

The vitamin C content of New York State vegetables, D. K. TRESSLER (*New York State Sta. Cir.* 196 (1942), pp. 16, fig. 1).—This circular, based chiefly on previously published work of the station as noted in the bibliography, brings together data on the ascorbic acid content of various vegetables, and discusses the factors, such as variety, freshness, maturity, cooking, fermentation, and dehydration, that affect the ascorbic acid content.

A comparison between interlitter and intralitter variation in rats with respect to the healing of rachitic bones by vitamin D, K. H. COWARD and E. W. KASSNER (*Biochem. Jour.*, 35 (1941), No. 8-9, pp. 979-982).—"It has been shown, by carefully planning an experiment designed primarily for other purposes and analyzing the variance according to the method proposed by Fisher, that the variation between litters of rats in response to vitamin D is much greater than the variation between rats of the same litter as judged by their weights when they were first given the rachitogenic diet. The results emphasize strongly the importance of using 'litter-mate' comparisons in biological assays of vitamin D."

TEXTILES AND CLOTHING

Directory of commercial testing and college research laboratories, A. E. RAPUZZI (*U. S. Dept. Com., Bur. Standards Misc. Pub.* 171 (1942), pp. III+63).—

This directory lists 244 commercial testing laboratories with 71 branch laboratories or offices, together with indications of the types of commodities which they are willing to test for commodity acceptance purposes. Laboratories of 199 colleges which are used not only for purposes of instruction but also to a considerable extent for research work are also listed. The laboratories are listed alphabetically and again according to geographical distribution. An outline is given of the certification plan in accordance with which manufacturers have expressed their willingness to certify to purchasers that material supplied on orders based on the indicated Federal specifications and commercial standards complies with the requirements and tests of these specifications. The types of commodities investigated are classified as follows: Animals and animal products (except wool and hair); vegetable food products, oil seeds, expressed oils, and beverages; vegetable products (except food, fibers, and wood); textiles; wood and paper; nonmetallic minerals; ores, metals, and manufactures (except machinery and vehicles); machinery and vehicles; chemicals and allied products; and commodities not elsewhere classified.

Determination of resilience of textiles by compression testing, K. R. Fox and E. R. SCHWARZ (*Textile Res.*, 12 (1942), No. 10, pp. 2-7, figs. 3).—This paper discusses the proper interpretation of the load-deformation curves obtained in testing the behavior of fabrics or bulk fiber during compression and the recovery therefrom. It is pointed out that the time factor is of importance and must be considered for an intelligent interpretation of compression-test diagrams. Further statistical methods for planning the tests and analyzing the data are suggested.

New fibre, made from cow's milk, used in textile manufacturing (*Jour. Milk Technol.*, 4 (1941), No. 6, pp. 343-346, figs. 4).—It is noted that this fiber, known as Aralac, is now being made on a commercial scale, after 4 yr. of experimentation, at Taftville, Conn., by a special manufacturing division of the National Dairy Products Corporation. Casein, which constitutes about 3 percent of skim milk, is extracted, dried and ground, treated with chemicals, and heated for conversion into a viscous honeylike form. This is forced through spinnerets, and the emulsion emerges as thousands of strands of fiber called "wet tow." After many other treatments, the wet tow becomes the soft fiber Aralac, which can be cut into any length. The felt hat industry was the first to use Aralac, and today most fur-felt and wool-felt hats in the United States, Canada, and South America are made in part from it. Textile mills, experimenting with the fiber, found that several processing changes were necessary before desirable blending qualities with other fibers were achieved. Aralac, as processed for textiles, was found to supply drape and substance which previously could be obtained only through the use of fur and wool in some fabrics.

What is "Aralac"? H. R. MAUERSBERGER (*Rayon Textile Mo.*, 23 (1942), No. 3, pp. 54-55, figs. 3).—In this article, which consists of excerpts from a speech by F. C. Atwood, it is pointed out that Aralac, although made from casein, is not, correctly speaking, a casein fiber but a protein base or modified protein man-made fiber, since the coagulated filaments formed by extruding the thick, sirupy casein dispersion through spinnerets do not constitute the Aralac fiber, and is only after the extruded filament has been subjected to various chemical treatments to harden it and modify both its physical and chemical nature that Aralac results. The properties of the Aralac fiber can be regulated by the type of chemical reaction to which the filaments are subjected, and in practice the chemical treatments to be applied are governed by the properties required in the than for the textile manufacturer. It is pointed out that further research can textile fiber. For example, a different fiber is made for the hat manufacturer

improve this protein-base fiber, and that even the present-day Aralac need not possess the weaknesses of the protein fiber as first made by the Italians.

The present situation in ramie fiber, A. C. WHITFORD (*Rayon Textile Mo.*, 23 (1942), No. 8, pp. 49-51, figs. 3).—This review of the ramie situation points to the successful development in America of a machine for decorticating ramie and of a process for degumming the fibers to overcome their brittleness. It is noted further that experiments have shown that ramie can be successfully and economically grown in the South, and that the domestic material can be decorticated with less loss to give a finer, more easily worked fiber than the imported Chinese ramie. In discussion of the chemical and physical properties of ramie, it is pointed out that it has greater tensile strength and a greater water absorptive power than cotton, and that the tensile strength of ramie fiber is from 30 to 60 percent greater when wet than when dry. In blends with wool or rayon or cotton it gives added strength and wearing quality, and prevents shrinkage upon soaking in water or laundering. The ramie blend, in the case of rayon, also prevents stretching and loss of strength upon wetting; and, in the case of cotton, results in a cloth with greater luster and eye appeal. Because of these desirable qualities and its promise as a new staple crop, it is predicted that ramie, either alone or in blends, will find increased war and post-war use.

The effect of sodium thiosulfate and sodium hydrogen sulfite on some silks, R. L. JOHNSON, M. E. LICHTER, and R. EDGAR. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 4, pp. 411-419).—"Quantitative comparison has been made of the effect of 50-volume baths of water and of N sodium thiosulfate in 10 hr. at 40° C. on the residual weight, ash nitrogen, and wet strength of plain-woven wild-silk fibroin, silk fibroin, and iron-weighted, lead-weighted, tin-weighted, tin-lead-weighted, and zinc-weighted silks. Similar data have been presented for the effect of 50-volume baths of 1.9232 N sodium hydrogen sulfite in 10 hr. at 40°, and for this treatment followed by 1 hour's steaming at 123.9°. But slight changes occurred in the total nitrogen or wet strength of the silks during these treatments. The effect of sodium thiosulfate on the weight and ash of the weighted silks appears anomalous. Sodium hydrogen sulfite, in 50-volume baths, 0.0500 to 2.0000 N, has been shown to have no effect in 1 hr. at 100° on the wet strength of either silk fibroin or wild-silk fibroin."

A new culture medium for the growth of *Chaetomium globosum*, W. G. CHACE and G. S. URLAUB (*Amer. Dyestuff Rptr.*, 31 (1942), No. 14, pp. 331-333, figs. 3).—This investigation was directed toward developing a medium better suited to the growth of *C. globosum* than the Czapek agar in general use, in order that a large quantity of the spores might be available for the accepted testing of mildew-proofed fabrics. The medium finally developed used finely divided cellulose (mechanically disintegrated) as a source of carbon and KH_2PO_4 as a buffer. It is claimed for the proposed medium that (1) the time of sporing is cut to 4 or 5 days, (2) the quantity of spores produced is many times that obtainable on Czapek agar, (3) growth of common air-borne contaminants is greatly reduced if not entirely eliminated, and (4) the work of preparation of the medium is not much greater than with other culture media.

Stain removal from fabrics: Home methods, M. S. FURRY (*U. S. Dept. Agr., Farmers' Bul.* 1474, [rev.] (1942), pp. [21+30, figs. 8]).—This revision of an earlier edition (E. S. R., 55, p. 898) presents the general principles of stain removal, and tells how to remove many kinds of stains from present-day fabrics.

HOME MANAGEMENT AND EQUIPMENT

Performance of domestic frozen food cabinets, J. E. NICHOLAS. (Pa. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 7, p. 232, fig. 1).—This report concerning three domestic-type frozen-food cabinets assigned to use by four families indicates satisfactory performance of the units in the freezing and frozen storage of various fruits and vegetables and meats prepared according to standard practices as the home supplies warranted packaging throughout the season. In the opinion of housewives, all of the food frozen was highly satisfactory. All of the foods were usable over the study period of 10 mo., and there were no losses. Frozen cauliflower was considered preferable to fresh cauliflower. The cost of operation for the 3-, 6-, and 15-cu. ft. cabinets was found to be 56, 65, and 123 kw.-hr. per month, respectively. A few tests on the rate of freezing of meat in different shapes, cuts, and weights, placed in the freezer with one flat surface in contact with the plate and the rest exposed to the air, showed that the entire piece did not freeze simultaneously. A 2.8-lb. steak required about a 2-hr. period to pass through the zone of crystal formation and was nearly uniformly frozen at the end of 6 hr.; these two periods, respectively, amounted to about 6 hr. and from 15 to 16 hr. with a 5-lb. roast. The latter, removed from the freezer and placed in a domestic refrigerator in a compartment at about 38° F., required nearly 10 hr. to reach the average temperature of 28°. After 30 additional hours, parts of the meat attained a temperature of 31.5°, with the largest portion below 30°.

Pressure gasoline and pressure kerosene stoves, A. E. BARAGAR (*Nebraska Sta. Cir.* 70 [1942], pp. 12, figs. 13).—This publication summarizes in nontechnical terms the factors of safety, construction, and performance from the detailed report noted previously (E. S. R., 87, p. 897).

MISCELLANEOUS

Proceedings of the Eighth American Scientific Congress.—V, Agriculture and conservation (8. *Amer. Sci. Cong.*, Washington, 1940, *Proc.*, vol. 5, pp. 348, pls. 9, figs. 7).—This volume contains about 40 papers presented before the section of agriculture and conservation of this Congress (E. S. R., 83, p. 1).

Experiment station research on war problems in the home, S. L. SMITH and G. ADAMS (*U. S. Dept. Agr., Misc. Pub.* 503 (1942), pp. [2]+36).—This publication, dealing with the work of the State agricultural experiment stations throughout the fiscal year 1940-41 on problems affecting the home, brings together findings of investigations in the following fields: Mineral utilization and requirements; vitamin functions and requirements; vitamins in foods; food selection, preparation, and utilization; food preservation; food consumption and nutritional status; textiles and clothing; the house—construction, care, and equipment; family economics; and family relationships.

Sixty-first Annual Report of the New York State Agricultural Experiment Station, [1942], P. J. PARROTT (*New York State Sta. Rpt.* 1942, pp. 96).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Farm Research, [October 1, 1942] (*Farm Res.* [New York State Sta.], 8 (1942), No. 4, pp. 12, figs. 8).—In addition to articles noted elsewhere in this issue, this number contains the following: Filtering Milk on the Farm, by A. C. Dahlberg (pp. 1, 2); Looking Ahead, by A. J. Heinicke (p. 4); and Dehydrating Fruits and Vegetables (p. 7) (E. S. R., 87, p. 450).

NOTES

Georgia University and Coastal Plain Station.—Silas H. Starr, director of the Coastal Plain Station since 1919, died November 6, 1942, at the age of 54 years. A native of Georgia and a graduate of the College of Agriculture in 1910, he served as instructor there from 1914 to 1919. He was widely known in the State for his work in developing its tobacco, peanut, hog, and cattle-raising industries and for his studies with shade tobacco near Bainbridge.

Massachusetts Station.—Dr. Arthur D. Holmes of the E. L. Patch Company has been appointed research professor of chemistry vice Dr. E. B. Holland, recently retired, and will devote himself very largely to the study of foods and problems of nutrition. Dr. Julia Holmes (nee Outhouse), formerly professor and chief in nutrition in the Illinois University and Station, has been appointed research professor in home economics.

Dr. William B. Esselen, Jr., assistant professor of horticultural manufactures, is devoting about half of his time to consultation service in the U. S. D. A. Office of Agricultural War Relations along food processing and packaging lines. Military leave has been given to Drs. Monroe E. Freeman and Dale H. Sieling, research professors of chemistry; Dr. Carl Olson, Jr., research professor of veterinary science; Ralph L. France, assistant research professor of bacteriology; Dr. Arthur S. Levine, assistant research professor of horticultural manufactures; Peter M. Bemben, laboratory assistant; Edward B. Donnelly, technical assistant in floriculture; and Dr. H. Robert DeRose, assistant chemist.

Minnesota University and Station.—The outstanding career of Dr. Ross A. Gortner, associated with the institution since 1914 and for nearly 25 years chief of its division of agricultural biochemistry, was brought to a sudden close by his death on September 30, 1942, at the age of 57 years. While at the station, he had made important contributions in many fields including the black animal pigments, or melanins; proteins, especially the cereal proteins and their relation to the properties of flour and dough; and colloids, especially their physico-chemical properties and the role of water in living processes. His contributions to scientific journals numbered over 300. He was also author of *Outlines of Biochemistry*, *Selected Topics in Colloid Chemistry*, and *J. Arthur Harris, Botanist and Biometrician*. He was a recipient of the Osborne medal in cereal chemistry and at the time of his death was president of Sigma XI.

Oklahoma Station.—The utilization of native bluestem pasture is being tested on an extensive scale on 1,450 acres of a land utilization area of 3,000 acres, which has been made available to the station by the U. S. D. A. Soil Conservation Service. The present tests involve use of different supplements and comparison of all grazing v. use of part of the area for hay.

Raymond Marshall and K. C. Davis, cooperative agents in cotton marketing of the U. S. D. A. Agricultural Marketing Service, have been succeeded by William B. Hudson and John D. Campbell.

Puerto Rico Federal Station.—Dr. Kenneth A. Bartlett, acting director since November 1941, has been appointed director.



EXPERIMENT STATION RECORD

VOL. 88

MARCH 1943

No. 3

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Alkaloids in certain species and interspecific hybrids of *Nicotiana*, H. H. and C. R. SMITH. (U. S. D. A.) (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 7, pp. 347-359, fig. 1).—Of wild species of *Nicotiana*, 29 which comprised a representative sample of the genus as regards phylogenetic grouping, chromosome number, and geographic distribution were found to contain one or more alkaloids. *N. alata*, *N. bigelovi*, *N. gossei*, and *N. wigandoides* apparently contained only nicotine. *N. glutinosa*, *N. maritima*, *N. otophora*, *N. tomentosa*, and *N. trigonophylla* apparently contained only nornicotine. *N. glauca* and *N. debneyi* contained largely anabasine with some nicotine. The remaining 18 species analyzed contained mixtures of nicotine with nornicotine, and in 13 of these nornicotine was the predominant alkaloid. In crosses between *N. tabacum*, which contains mostly nicotine, and species whose alkaloidal complex was made up largely or entirely of nornicotine, the hybrids contained mainly nornicotine, together with small amounts of nicotine. The F_1 and amphidiploid *N. tabacum* \times *N. glauca* (anabasine) contained mostly anabasine with some nicotine. In one sample of this F_1 a trace of nornicotine was detected. It was concluded that the genetic factors for nornicotine and anabasine formation are partly dominant in the F_1 over those controlling nicotine formation. Although the species considered as the probable wild progenitors of the cultivated *N. tabacum* and *N. rustica* have a low alkaloidal content which is predominantly nornicotine, the two cultivated species themselves have a high alkaloidal content that is mostly nicotine. A suggested explanation of this relation is that the manner of origin, selection, and culture of the cultivated species produced a high alkaloidal content, which in turn favored the formation of nicotine.

The distribution of phytic acid in wheat and a preliminary study of some of the calcium salts of this acid, J. G. HAY (*Cereal Chem.*, 19 (1942), No. 3, pp. 326-333, fig. 1).—Analyses, by methods outlined, of various commercial (English) mill products of wheat showed that the phytic acid phosphorus was proportional to the fiber content. In certain constituents of these products, notably germ and parenchymatous cellular tissue of the endosperm, the phytic acid phosphorus was in a higher ratio to the fiber than in the pericarp tissue. The calcium salts of phytic acid produced at different pH values and dried at different temperatures were characterized as to their composition and solubility. With the phytic acid extracted from bran, the calcium salt obtained at pH values likely to exist in the digestive system was a hexacalcium salt.

Kinetics as a function of temperature of lipase, trypsin, and invertase activity from -70 to 50° C. (-94 to 122° F.), I. W. SIZER and E. S.

JOSEPHSON (*Food Res.*, 7 (1942), No. 3, pp. 201-209, figs. 3).—It was found that the rate of hydrolysis effected by all three enzymes at temperatures both above and below 0° C. increases exponentially with temperature in accordance with the Arrhenius equation. Heat inactivation of these enzymes occurred above 40°. A sharp break in the relationship of rate to temperature appeared at from 0° to -2°, a low activation energy characterizing the system above this temperature. The activation energies observed were as follows: Lipase 7,600 and 37,000 calories, trypsin 15,400 and 65,000, and invertase 11,100 and 60,000 calories. In all the enzyme systems studied (except in that of lipase with glycerol present in the digest, of which the freezing point was -18.5°) the shift in activation energy from a low to a high value occurred at about the temperature at which the digest changed from liquid to solid. It is therefore impossible to predict enzyme action below 0° from experiments made above this temperature. It was found that although enzyme action is markedly retarded in the solid state, low temperatures do not inactivate enzymes. The storage of lipase, trypsin, and invertase for 27 days at -70° did not affect their hydrolytic activity subsequently measured at 30°. The application of these results to the problem of low-temperature storage of foods is pointed out.

Micro-Kjeldahl nitrogen determination without use of titration procedure, W. H. TAYLOR and G. F. SMITH. (Univ. Ill.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 5, pp. 437-439, figs. 2).—Two modifications avoid the troublesome use of methyl red as indicator. The first method consists in a potentiometric titration to the pH represented by the boric acid absorption solution after dilution to a definite volume and estimation of the ammonia content by reference to a calibration curve. The second consists in reading the ammonia content from a calibration curve of pH values plotted against milliliters of 0.01 N ammonia, pH having been determined by means of a direct-reading meter.

An improved Soxhlet extractor, M. H. NEUSTADT. (U. S. D. A.) (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 5, p. 431, fig. 1).—The freedom of flow of the solvent through the thimble was increased by placing in the extractor a piece of glass rod of such a length as to rest at an angle and to support the thimble about 3.25 cm. above the bottom of the extractor. In the extraction of fat from samples of soybean flour the rate of removal of the soluble material was markedly increased.

Stable sodium thiosulfate and starch solutions, J. EHRLICH (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 5, p. 406).—A 0.1 N thiosulfate solution was effectively stabilized by adding 0.05 percent sodium hydroxide and 0.1 percent sodium benzoate. A starch solution of essentially the A. O. A. C. formula was stabilized by 0.1 percent of the benzoate and 0.1 percent of sodium hydroxide.

Amperometric titrations: Amperometric determination of phosphate with uranyl acetate, I. M. KOLTHOFF and G. COHN. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 5, pp. 412-418, figs. 8).—A procedure for the amperometric titration of phosphate with uranyl acetate at room temperature is given. The accuracy was shown to be 1 percent or better with from 0.01 to 0.0003 M concentrations of o-phosphate. In 0.0001 M phosphate the accuracy was of the order of 4 percent. When the phosphate concentration is greater than 0.004 M the galvanometer can be used simply as a null-point instrument. Uranyl acetate is added with exclusion of air until the deflection of the galvanometer suddenly increases. Alkaline earth phosphates can be titrated by the standard procedure. Calcium in large amounts, iron, and organic anions interfere. Methods for eliminating the interference are described.

Quantitative determination of cellulose in raw cotton fiber: A simple and rapid semimicro method, J. H. KETTERING and C. M. CONRAD. (U. S. D. A.).

(*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 5, pp. 432-434, fig. 1).—A new semimicromethod for the quantitative determination of cellulose in raw cotton, simpler and more rapid than any heretofore available, accomplishes the maximum removal of the accompanying organic noncellulose materials with a minimum of equipment, sample, and damage to the fiber itself. The method consists of a 4-hr. Soxhlet extraction with hot ethyl alcohol, followed by drying and a 2-hr. extraction with boiling 1 percent sodium hydroxide. The cellulose is determined by dichromate oxidation of the whole sample and titration of the residual dichromate with ferrous ammonium sulfate. The proposed method is recommended particularly for the determination of the cellulose content of raw cotton and may be used in analyses of desized fabrics but not for cellulosic materials which contain lignin.

A special feature of the procedure is the titration of potassium dichromate solutions with ferrous ammonium sulfate using *o*-phenanthroline indicator over a ground-glass plate beneath which is an electric light. This is much more rapid and convenient than the usual titration with an outside indicator and spot plate.

Phosphorus analysis of plant material, B. R. BERTRAMSON. (Oreg. Expt. Sta.) (*Plant Physiol.*, 17 (1942), No. 3, pp. 447-454).—The author describes a method based upon the extraction of the finely ground plant material with 1 percent sulfuric acid, a reagent which he found to effect a separation of the inorganic phosphate content from the organically combined phosphorus such that the latter could be determined as the difference between total phosphate content and the phosphate extracted by the dilute acid and colorimetrically determined.

Spice contamination and its control, J. YESAIR and O. B. WILLIAMS (*Food Res.*, 7 (1942), No. 2, pp. 118-126).—In general, spices as received by importers showed heavy contamination with bacteria. There may be an appreciable reduction in the bacterial content during their processing at the manufacturing plants through mechanical removal by screening methods.

Several lots of black pepper were subjected to heat, ranging from a treatment of 5 lb. of steam pressure for 5 min. to 15 lb. of pressure for 15 min. Results indicated that the spice contamination varied in its resistance, but that a relatively mild treatment is effective in most instances. Cooking tests indicated a loss in potency of about 10 percent following a heat treatment of 15 min. at 15 lb. of pressure. Practical sterility of spices was obtained by the use of ethylene oxide. The effectiveness of this agent appeared to be due to a true germicidal property and not to a bacteriostatic action. Ethylene glycol was much less effective than ethylene oxide. Only moderate destruction of vegetative forms or spores was effected by ethyl formate. Formaldehyde was effective, especially against spores, although destruction may have been due to the combined effect of residual formaldehyde and the heat treatment used to destroy vegetative cells. Upon vegetative cells there may be a combined effect of destruction and bacteriostasis. Ultraviolet light and ethyl ether were ineffective in the tests which were made.

Action of Visking sausage-casing material on bacterial growth, I. C. HALL (*Food. Res.*, 7 (1942), No. 2, pp. 104-110, figs. 2).—Pieces of a sausage-casing material resembling cellophane were cut 5 by 4.5 cm., laid upon the surface of poured plates of 2-percent agar peptone medium in Petri dishes, and their effects upon the growth of various organisms compared with those of glass cover-slips of the same size. The behavior of the following organisms was observed: Obligate anaerobes—*Bacillus botulinus* (types A and B), *B. perfringens* (type A), *B. bifementans*, *B. sporogenes*, and *B. parapatrificus*; facultative aerobes—*B. carnis*, *B. tertius*, *B. polymyxa*, and *B. histolyticus*; facultative ana-

erobes—*Bacterium coli*, *B. aerogenes*, *B. proteus*, *B. mucosum*, and *B. paratyphosum alpha*; obligate aerobes (group 1—intermediate)—*Bacillus anthracis*, *B. subtilis* (Ford), *Micrococcus aureus*, and *B. subtilis* (Cohn); and obligate aerobes (groups 2—strict)—*B. subtilis* (Marburg), *B. atterimus*, *Bacterium pyocyanum*, *B. aertryke*, *B. cloacae*, and *B. fluorescens*.

The only spore-bearing bacteria which grew under Visking covers were the facultative aerobes and members of the first or intermediate group of obligate aerobes. None of these is likely to cause spoilage, none has been known to cause food poisoning, and all are greatly inhibited by the reduced supply of oxygen under Visking covers. Of the obligate anaerobes and strictly obligate aerobes, none will grow in agar plates under Visking and, therefore, almost surely not in sausages. The Visking casings used on cervelat summer sausages not only inhibit the growth of the obligate anaerobes by allowing the passage of oxygen, but they also inhibit the growth of the obligate aerobes and to some extent that of many facultative aerobes by restricting the passage of oxygen.

Detection of *Bacillus thermoacidurans* (Berry) in tomato juice, and successful cultivation of the organism in the laboratory. R. M. STERN, C. P. HEGARTY, and O. B. WILLIAMS (*Food Res.*, 7 (1942), No. 3, pp. 186-191).—The organism named fails to grow in many artificial culture media, and when such growth is obtained the organism shows a tendency to attenuation or loss of its ability to grow in, and to cause the characteristic "flat-sour" spoilage of, tomato juice. A culture of *B. thermoacidurans* in an artificial medium was acclimatized, however, by repeated transplanting from tomato juice to tomato juice until spoilage would always develop upon its inoculation into normal juice. A combination containing proteose peptone, yeast extract, glucose, and K_2HPO_4 at pH 5 proved to be a satisfactory medium for the cultivation of the organism. Abundant crops of vegetative cells and of spores were obtained in this medium. Continued transfer of *B. thermoacidurans* on nutrient agar produced cultures that were unable to grow in and spoil normal tomato juice. On the other hand, continued transfer of the organisms on proteose peptone acid agar had no apparent influence on the ability of the organism to spoil tomato juice. After 4 months' storage in the ice box sealed cultures on proteose peptone acid agar of *B. thermoacidurans* were still viable and were still able to cause spoilage in tomato juice.

For the detection of *B. thermoacidurans* in tomato juice a plating technic employing proteose peptone acid agar was found to be most satisfactory because the results obtained give both a qualitative and quantitative picture of a spoilage case. Tomato juice was observed to have an inhibiting effect on the growth of *B. thermoacidurans*. Only 1 cc. of juice, therefore, was plated out in 20 cc. of medium.

The preparation and absorption spectra of five pure carotenoid pigments. F. P. ZSCHEILE, J. W. WHITE, JR., B. W. BEADLE, and J. R. ROACH. (Ind. Expt. Sta. and U. S. D. A.). (*Plant Physiol.*, 17 (1942), No. 3, pp. 331-346, figs. 4).— α -Carotene, β -carotene, cryptoxanthol, luteol, and zeaxanthol were isolated and purified by chromatographic and crystallization methods accompanied by spectroscopic control. The absorption spectrum of each was determined from 3,800 to 5,200 a. u. by a photoelectric spectrophotometric method. Absorption coefficients were found to be relatively insensitive to changes in slit width, except in regions where absorption values change rapidly with wavelength. Experiments with mercury arc radiation and filters also indicate that scattered radiation is negligible. The absorption values given are considered a suitable spectroscopic basis of analysis for individual carotenoids. Differences due to solvent are discussed.

Vitamin-B₁: Estimation in yeast and bread and stability during bread

making, E. R. DAWSON and G. W. MARTIN (*Jour. Soc. Chem. Indus., Trans.*, 60 (1941), No. 9, pp. 241-245).—Different methods for extraction and estimation of thiamin in yeast and bread are reviewed. Of these, it is indicated that the modification of the thiochrome method described by Pyke (E. S. R., 85, p. 701) and the further modification suggested by Wang and Harris (E. S. R., 83, p. 851) are the most satisfactory. For extracting thiamin from yeast, it is recommended that a suspension of the sample in 0.04 N acetic acid be heated to boiling, cooled, and incubated with takadiastase for 4 hr., a portion of the diluted centrifuged solution then being used for the thiochrome estimation. For extraction from bread, the procedure outlined by Pyke or the shorter boiling method gives satisfactory results, although care must be exercised in the latter method to prevent charring of the semisolid suspension. Because of this difficulty, it is found desirable to soften the dried sample by heating the 0.04 N acetic acid suspension for 15 min. by immersion in boiling water and to liquefy the starch by incubating the cooled suspension with takadiastase for 1 hr. preliminary to the boiling and the subsequent treatment with takadiastase. Analyses by the recommended methods of a series of thiamin-rich yeasts and of breads made with these yeasts, over a 6-mo. period in large-scale commercial production of 2-lb. loaves, showed that 92 percent of the thiamin added to the dough as thiamin-rich yeast is retained in the bread.

Determination of vitamin B₁ by yeast fermentation method: Improvements related to use of sulfite cleavage and a new fermentometer, A. S. SCHULTZ, L. ATKIN, and C. N. FREY (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, pp. 35-39, figs. 5).—The method, described in detail, is a modification of the original method (E. S. R., 79, p. 11) and depends on the chemical inactivation of thiamin by sulfite and the determination of the interfering substances exerting fermentation activity in the residue. Approximately 99 percent of the fermentation activity of thiamin is destroyed by sulfite at pH 5.0-6.0 at 100° C. for 30 min. Similar treatment of natural materials seldom results in such complete inactivation of the fermentation-stimulating property, but in the majority of cases 90 percent or more of the activity is removed by sulfite, leaving a sulfite blank of 10 percent or less. The known interfering substances are not affected by this treatment. In the assay, therefore, the fermentation activity is measured before and after sulfite treatment, and the difference, expressed in terms of pure thiamin chloride, is taken as a measure of the thiamin content of the unknown. A small, compact, fermentometer, occupying about 2 sq. ft. of table space and requiring only one-half the quantities employed in the original method, has been designed to make the yeast fermentation method available for routine use. This apparatus is described and illustrated. Data obtained in the application of the technic to a variety of materials are presented.

The accuracy of the spectrophotometric determination of vitamin B₁, K. H. COWARD (*Quart. Jour. Pharm. and Pharmacol.*, 14 (1941), No. 4, pp. 329-336).—This paper presents an analysis of the results of spectrophotometric determinations of four different solutions of thiamin in five different laboratories. The tabulated results of the determinations indicate that rather wide variations were obtained. The two possible sources of error, (1) differences in the purity of the samples and (2) differences in instruments (and the operators), are discussed. An appendix on the analysis of variance of the results, by J. O. Irwin, is given.

A new colorimetric method for determining small quantities of nicotinic acid, R. P. DAROGA (*Jour. Soc. Chem. Indus., Trans.*, 60 (1941), No. 10, pp. 263-266, figs. 3).—In the simple rapid method, described in detail with regard to reagents and procedure, the nicotinic acid is precipitated with phosphomolybdic acid, and the precipitate, after washing with dilute acetic acid, is dissolved in

0.1 N NaOH. The nicotinic acid-phosphomolybdate complex is reduced by treating the alkaline solution with stannous chloride, and the molybdenum-blue color is matched in the tintometer against the color developed by similar treatment of a nicotinic acid standard. The nicotinic acid is extracted from foodstuffs by treatment of a water suspension of the material with sodium chloride and calcium oxide and steam distilling. The distillate, collected in 20 percent HCl, is concentrated by evaporation. For application of the method to urine, the diluted urine is steam-distilled for 20 min. to remove the interfering compounds trigonelline and methylpyridinium hydroxide, which are also precipitated by the reagent. The residual mixture of urine and water is cooled and treated with lime and sodium chloride and carried through the procedure adopted for foodstuffs. Determinations by this procedure gave quantitative recoveries of nicotinic acid added to food or urine samples, showed in normal urine a mean nicotinic acid and amide content of 1.5 mg. per 100 cc., and gave values for foodstuffs agreeing with those obtained by other workers. Mean values, in milligrams per 100 gm., are reported for a few materials as follows: Liver extract 110, dried bakers' yeast 30, yeast tablets 45, dried beef extract 64, dried milk powder 2.3, and rice 1.0.

Further notes on the determination of ascorbic acid and sulphur dioxide in fruit juices, H. F. W. KIRKPATRICK (*Jour. Soc. Chem. Indus., Trans.*, 60 (1941), No. 11, pp. 298-299).—In continuance of earlier work (E. S. R., 87, p. 481), a study was made of the effect of SO₂ with varying sugar concentrations on the direct titration of citrus fruit juices with dichlorophenolindophenol. It was found that SO₂ in citrus juices did not affect the titration until the sugar concentration of the juice fell below 20 percent. With 15 percent of sugars, the critical amount of SO₂ was about 1,000 p. p. m. and with 10 percent about 500 p. p. m. Equilibrium between the sugar and SO₂ was reached in 1 hr. The titration procedure, similar to that noted in the previous study, is described, together with a modified procedure for separation of the SO₂. The latter permitted an accurate and rapid determination of the SO₂ in the same operation as the determination of the ascorbic acid by titration with the dye solution. The direct titration method was not affected by SO₂ in the titrated solution in amounts up to 30 p. p. m. The possible application to materials containing little or no hexose solution is suggested.

Multiplication of bacteria in water and its significance in food spoilage, C. H. CASTELL and L. A. McDERMOTT (*Food Res.*, 7 (1942), No. 3, pp. 244-253, figs. 3).—Water from several hundred deep and shallow wells having an initially low bacterial content contained organisms which underwent extensive multiplication when the water was enclosed in a container. The type of container and its size (up to 80 gal.) appeared to have relatively little effect on the numbers of bacteria which developed. Inoculations of sterile tap water with pure cultures of known organisms appeared to confirm the observation that growth in water of low organic content was restricted to certain groups of gram-negative bacteria. Known species of *Pseudomonas* were particularly active in water. Results of water examinations made directly after samples were taken from the well and again after the samples had been sent through the mail to the laboratory were widely discrepant, as were those of examinations of samples taken at various points in the same water supply, great increases in dead-end or unused pipes being especially noted.

The types of bacteria that develop were observed to include mainly nonsaccharolytic, gram-negative organisms having the general characteristics of the genera *Alcaligenes*, *Pseudomonas*, and *Achromobacter*. A large proportion of these were lipolytic, proteolytic, and oxidase-positive. Many were active at temperatures not far above freezing. That such organisms are injurious to

stored meats, fish, butter, and other nonacid, protein, or fatty foods is considered self-evident.

Preliminary experiments indicated that initial concentrations of 1 p. p. m. or more of chlorine markedly reduced the number of organisms, and there was no evidence of aftergrowth after a period of 120 hr. Lower initial concentrations of chlorine (from 0.12 to 0.37 p. p. m.) effected a temporary decrease or lag in growth, followed by a rate of increase which was greater than that in the control (unchlorinated) water.

Abstracts of papers presented at Technical School for Pickle and Kraut Packers, Michigan State College, East Lansing, Michigan, February 17, 18, and 19, 1942, F. W. FABIAN. (Mich. State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 7, pp. 206-212).—Abstracts of papers from State colleges and experiment stations collected under this title are as follows: The Death-Rate of Microorganisms During the Pasteurization of Cucumber Pickle (p. 207), and Pasteurization of Pickle Products—A Review (pp. 210-211), both by J. E. Etchells and I. D. Jones (U. S. D. A. and N. C. Expt. Sta.); Producing Sauerkraut Acceptable for Government Purchase (p. 207), Important Bacteria That May Be Harmful or Beneficial to Kraut Fermentation (p. 208), and When, How, and Why Should Kraut Factories be Heated? (p. 211), all by C. S. Pederson (N. Y. State Sta.); and Factors Influencing the Spicing of Pickles, by F. W. Fabian and M. C. van Wormer (p. 207). Vitamins, What They Are and What They Do, by C. F. Huffman (pp. 208-209), Vitamin A and C Content of Pickles From Different Parts of the United States and Canada, by L. J. Camillo, C. A. Hoppert, and F. W. Fabian (p. 209), and Production Shorts—A Symposium on Cucumber Production Problems, by J. H. Muncie, C. B. Dibble, and J. Tyson (p. 210) (all Mich. State Col.).

Cooperative pickling investigations of the United States Department of Agriculture, H. E. GORESLINE. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 8, pp. 232-233).—This is a brief general account of the Department of Agriculture work on pickling begun under a separate appropriation in 1935 and now carried on in cooperation with the North Carolina Experiment Station and one of the large pickling companies. The intention to cooperate with the pickling industry as a whole and some problems of wartime packaging are topics given special emphasis.

Olive experiments of 1940-41 season, W. V. CRUESS, J. R. GILLILAND, J. OSBOURNE, and J. SUGIHARA (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 4, pp. 113-115).—The authors report briefly upon some results of mixed pack experiments, further experiments on buffer processing, role of enzymes in darkening, further data on use of calcium salts in ripe processing, calcium chloride in processing Greek-style olives, experiments on use of calcium chloride on green ripe olives, tests on use of calcium chloride with Spanish green olives, green olive experiments, and frozen pack.

Freezing vs. canning, S. BULL. (Univ. Ill.). (*Quick Frozen Foods*, 4 (1942), No. 12, p. 21).—This is a brief discussion of the relative merits of frozen and canned foods with respect to palatability, safety, economy, nutritive value, and use of critical war materials.

Dehydrated food specialties, W. V. CRUESS, H. F. FRIAR, and J. SUGIHARA. [Univ. Calif.] (*Canner*, 95 (1942), No. 11, pp. 20, 22).—Very general notes are given concerning the preparation, use, and quality of the following dehydrated products: Dried vegetable powders, tomatoes, soup mixtures, salad mixtures, dehydrated citrus fruits for marmalade, precooked dry rice, precooked dehydrated beans, precooked dehydrated split peas for soup, and dehydrated meats.

Vegetable tests, W. V. CRUESS. (Univ. Calif.). (*West. Canner and Packer*, 34 (1942), No. 10, pp. 39, 41-42, fig. 1).—This paper gives a brief review of

investigations conducted by the University Fruit Products Laboratory on dehydrated vegetables, with recommendations to producers.

Experiments on drying unsulfured apricots and peaches, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 5, pp. 135, 157).—These experiments show that peaches and apricots are not prevented from darkening by dipping in brine, or pineapple juice, or in thiourea solution. They also show that dried peaches and dried apricots of fairly good color and of exceptionally good cooking quality can be secured by steaming the fruit until cooked through, or by heating it in a cane sugar sirup or in a glucose corn sirup solution before the fruit is dehydrated or dried in the sun. Dehydration of fruit so treated is more practicable than sun drying as there is less darkening and no danger of spoilage by molding or fermentation during dehydration. The author believes that both steaming and the heating in sirup before drying have commercial possibilities and suggests them for small commercial trial by operators of dehydrators. Samples 3 yr. old stored at 48° F. were still of good color, flavor, and cooking quality.

A note on the Japanese quince, A. S. LEVINE. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 6, p. 177).—The pleasing fruity aroma of the fruit is lost after heat treatment, the jelly prepared from this quince alone having little flavor. The Japanese quince improves the flavor and character of such products as apple jelly or European quince jelly, however, when used at the rate of about 20 percent of the fruit, and has additional possibilities in improving the flavor of apple products, including low-acid ciders and cherry, plum, and prune preserves. In addition to its high acid content this quince is a good source of pectin. Its low starch content permits the concentrated juice to be used directly as a source of acid and pectin.

Some factors affecting taste and flavor of beverages, M. LEVINE. (Iowa State Col.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 3, pp. 82-85, 91-93, figs. 2).—Precipitation of flavors may be affected by either over- or undersweetness or sugar inversion. Copper, iron, or chlorine in the water may cause off-flavors, especially in the presence of air or under exposure to sunlight. Micro-organisms may cause flavor changes. Vitamin B produced very objectionable taste, particularly in true fruit and cola products, whereas vitamin C tended to preserve the true fruit flavors.

Survey of apple juice packed in 1940, H. H. MOTTERN, T. NOLD, and J. J. WILLAMAN. (U. S. D. A. et al.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 3, pp. 68-71).—Recommendations presented by the authors are in part as follows:

The apples used may be small but must be of good quality, sound, and ripe. A blend is always better than a single variety. The juice may be clarified or not, at will. Enzyme clarification probably leaves better color and flavor in the juice than does the gelatin-tannin process, but it costs more. Centrifuging for the production of a cloudy juice is very satisfactory. Deaeration should probably be employed if plain tin containers are used. Glass containers are satisfactory beyond question, since glass cannot affect the juice, but breakage and weight have to be considered. Enameled tin is less likely to affect the juice than plain tin. The juice should be flash pasteurized at from 180° to 190° F. for a few seconds and placed in the cans within this temperature range. The cans should be inverted for 2 or 3 min. and then cooled quickly.

Cider preserved by new method (*Ohio Sta. Bul.* 617 (1940), p. 36).—This report notes improvement of cider flavor by bubbling carbon dioxide through the cider to remove oxygen before pasteurizing.

Honey wine: This article reports on experiments on honey mead (honey wine) and honey brandy, F. FILIPPELO and G. L. MARSH. (Univ. Calif.).

(*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 3, pp. 78-79, 90).—Certain nutrient salts providing potassium, nitrogen, and phosphate aided fermentation of mead. Variety of honey and variety of yeast were found to affect the rate of fermentation and the quality of the product.

A very satisfactory honey brandy was obtained. A brandy flavored with from 5 to 10 percent of honey added after distillation was also very satisfactory.

Experiments with antioxidants for preventing flavor deterioration in canned orange juice, A. J. NOLTE, G. N. PULLEY, and H. W. VON LOESECKE. (U. S. D. A.). (*Food Res.*, 7 (1942), No. 3, pp. 236-243, figs. 3).—Nine antioxidants (*D*-isoascorbic acid, asparagine, lecithin, resorcinol, hypophosphorus acid, cholesterol, "methyl glucamine," α -naphthol, and methyl-*p*-aminophenol (Elon)) in different concentrations were added to Florida Valencia orange juice in an attempt to prevent off-flavor development in the canned product. Although some of the antioxidants prolonged the induction period as measured by the peroxide value of the petroleum ether-soluble matter of the canned juice, no correlation could be found between the peroxide value and taste of the juice. Such correlation was made difficult by peel oil in the experimental packs. As measured by the peroxide number of the petroleum ether-soluble material of canned orange juice, there were three induction periods. This is believed to be due to the successive oxidation of terpenes, fats, and resins in the canned juice, probably in the order named. None of the antioxidants in the amounts used prevented the destruction of sulfhydryl compounds or the formation of higher ketones in the juice.

There was no correlation between vacuum in the cans and peroxide value of the petroleum ether extract of the canned juice. Juice packed in enamel cans was found to have a better taste than that packed in plain tin cans, but it is questioned whether the difference could be detected by the average consumer.

An improved orange juice concentrate, A. SEDKY, C. R. FELLERS, and W. B. ESSELEN, JR. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 5, pp. 136-138, figs. 3).—The authors describe an apparatus designed to concentrate sweetened or unsweetened orange juice with a minimum loss of flavor and vitamin C. A method of juice extraction from navel oranges which was successful in eliminating most of the bitter principle usually present in the juice is also described. It was further shown that the addition of sugar to orange juice before concentration gives a pleasing effect to the concentrate and does not affect the vitamin C content, and that, if carefully prepared, a concentrate from a sweetened juice can be used successfully as a beverage base. A beverage containing juice reduced to 30 percent of the original volume was found to have good flavor and a vitamin C content comparable to that of fresh orange juice.

The effect of ethylene treatment upon the recovery of citrus pectin, J. L. HEDD (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1941), No. 4, pp. 100-103, 125, figs. 2).—After ethylene treatment the method of extraction should be modified to obtain maximum jelly-unit yields of pectin. When identical methods of extraction were applied, a lower jelly-unit yield of pectin was recovered from ethylene-treated fruit than from fruit stored for the same time and at the same temperature without ethylene treatment, and fruit thus stored yielded less jelly units than did fruit extracted prior to storage.

Experiments with asparagus butts: Preliminary report, G. L. MARSH and W. V. CRUESS (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 11, pp. 333-336, 344, figs. 2).—The authors discuss probable available tonnages, composition of the stalks, possible fertilizing value, value as feed for livestock, drying for feed, drying ratio and time, extraction and utilization of the juice, frozen pack juice, canned juice, use in replacing brine in canning of asparagus,

concentrates, lactic soured juice for canning, and drying the juice. Canning the edible portion of the asparagus in juice from the butts instead of using brine for this purpose yielded a product of greatly superior flavor. The juice acidified by *Lactobacillus plantarum* gave the canned produce a noticeable flavor resembling that of sauerkraut, however.

AGRICULTURAL METEOROLOGY

Climatology in the service of agriculture, C. W. THORNTON (U. S. Dept. Agr., Soil Conserv. Serv., 1942, SCS-MP-25, pp. [1]+9).—A paper delivered before the Second Inter-American Conference on Agriculture, Mexico City, July 6-16, 1942.

Astronomy, maps, and weather, C. C. WYLIE (New York and London: Harper & Bros., [1942], pp. X+449, [pl. 1], figs. [210]).—The book contains chapters on the seasons and the calendar, the weather, and weather forecasting, as well as incidental meteorological data elsewhere.

Insects and weather as they influence growth of cactus on the central Great Plains, C. W. COOK. (Utah State Agr. Col.). (*Ecology*, 23 (1942), No. 2, pp. 209-214, figs. 6).—The recent drought period (1930-40) brought a very noticeable increase of cacti in grazing lands of the central Great Plains, and this led to a study (1937-40) of the causes of this increase during dry years and the reverse during moderately wet years. Insects were found to play an important role in cactus control, and rodents, especially rabbits, were important in seed dispersal. Of the insects studied, *Chelinidea vittiger* (Uhl.), *Melittara dentata* (Grote), and *Dactylopius* sp., only the last two are considered highly important. The last, a mealy bug, reproduces very prolifically, and cactus plants often become entirely covered and soon die. The larval stage of the most important insect, *M. dentata*, a moth, eats the center of the fleshy stems, causing death of the plant. Moist warm weather was found conducive to population increase of these insects. It is concluded that drought is the primary factor controlling the balance between cactus and insects, but that proper grazing of the native forage greatly aids in producing a favorable habitat for the insects, thus inducing an increase in their numbers and a decrease in cactus.

The effect of unfavorable weather at harvest upon the quality of North Dakota wheat, R. H. HARRIS (North Dakota Sta. Bimo. Bul., 5 (1942), No. 1, pp. 23-28, figs. 4).—Since extremely unfavorable weather during the current season has caused heavy financial losses to North Dakota wheat growers and extensive blight, "black point" (*Alternaria* and *Helminthosporium sativum*) sprouting, and other damage to quality of the grain is anticipated, a summary of recent investigations by the station is presented to elucidate the relationships between these degrading factors and wheat quality. Briefly, if heavy damage to durum wheat by blight and black point is present, extreme diligence should be exercised to keep the quantity allowed to go to the mill below 5 percent, and when light and heavy damage are both present the effect on quality will be additive, so that greater attention must be paid to the maximum amount of heavily affected wheat allowed in the mix. Sprouting in durum wheat caused lowering of the grade, the test weight per bushel, and the semolina yield and macaroni color. Where length of the sprouts was less than half that of the kernel and they were not present in more than 10 percent by weight of the total, the effect on milling characteristics was not great but test weight and grade were still reduced, and especially the latter.

Use of water by native vegetation, A. A. YOUNG and H. F. BLANEY. (U. S. D. A.). (Calif. Dept. Pub. Works, Div. Water Resources Bul. 50 (1942), pp. XII+160, figs. 35).—The purpose of this monograph was to bring together the

results of studies of consumptive use of water by a number of species of native vegetation as determined by the Soil Conservation Service for various western climatic conditions in the United States, as well as some of the results of similar investigations by other agencies (seven pages of references), such studies having been carried on for many years. The four general methods used in such investigations are tank studies, soil-moisture investigations, stream-flow studies, and water-table fluctuations. Detailed data are presented for saltgrass, wire rush, willows, tules and cattails, brush and weeds on outwash slopes in arid and semi-arid regions, weeds along ditch banks or in irrigated fields, and riparian growth along streams. Daily water-table fluctuations in areas of high ground water are usually the result of consumptive use by the overlying vegetation. Fluctuations respond to those factors of weather which cause greater or less transpiration.

Monthly Weather Review [July–August 1942] (*Mo. Weather Rev.* [U. S.], 70 (1942), Nos. 7, pp. 153–180, pls. 11, figs. 8; 8, pp. 181–201, pls. 10, figs. 4).—In addition to meteorological, climatological, solar radiation, and sunspot data, No. 7 contains a contribution on Hourly Distribution and Intensity of Precipitation at Kansas City, Mo., by H. H. Martin (pp. 153–159), and No. 8 an article noted below.

[Meteorological data at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul.* 32 (1941), pp. 13–14).—Tabulated data are given on rainfall in inches by months and years, 1923–31 and 1932–40; dates on which first and last killing frosts (32° F.) occurred and the number of growing days at Tifton, 1923–40; and temperature by months, 1940.

Weather (Rhode Island Sta. Rpt. [1941], pp. 59–60).—A brief report on Rhode Island temperatures, snowfall, rainfall, and early and late killing temperatures for 1941.

Stream lines of New England, V. CONRAD (*Mo. Weather Rev.* [U. S.], 70 (1942), No. 8, pp. 181–185, figs. 4).—A rather strong correlation exists between the frequency of winds from a given direction and their average velocity; the more frequent the direction, the greater the average velocity—the strongest winds come mostly from the most frequent direction. The assumption can be made that the average velocity of the winds from a particular direction is approximately in linear proportion to the frequency of the direction. Streamlines for January, April, July, and October are shown on maps of the region.

Daily river stages at river gage stations on the principal rivers of the United States, M. BERNARD (*U. S. Dept. Com., Weather Bur., Daily River Stages*, 37 (1939), pp. III+169, pl. 1).—This is the usual annual volumes (E. S. R., 86, p. 295), issued in 1942 and continuing the record through 1939.

Experience with irrigation-water forecasting in Upper Columbia drainage basin during 1940, J. C. MARR. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 143–144).—The author finds that dry watershed conditions during the preceding fall usually, though not always, reduce the run-off from snow cover. More than 4 years' snow survey record may be required to determine the relationship between water content of snow cover and run-off accurately. Adjacent drainage areas may not respond alike in run-off even though they are subject to the same storm effects; diversity in elevation, depth of area, and regulating influences make it unsafe to assume such parallel performance.

Correlation of stream-flow and snow-cover in Colorado, R. L. PARSHALL. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 153–159, figs. 6).—That reliable forecasting of run-off for Colorado streams, as based on snow surveys, will be attained cannot be definitely stated at this time because of the limited period of records available for correlation. The author points out that in some of the forecast diagrams presented here a fair agreement is to be noted, while in others rather wide variations appear. In some instances the

record of surveys on snow courses located in an adjacent drainage indicates as good correlation as for the course on the stream itself, if not better.

The photographic method of forecasting appears to have promise, as shown by the April 1 relations for 1938, 1939, and 1940. The record is too limited in time to support conclusions as to the final success of this method of forecasting.

Nevada cooperative snow surveys, C. ELGES, J. E. CHURCH, H. P. BOARDMAN, ET AL. (Nev. Expt. Sta., U. S. D. A., et al.). (*Nev. Coop. Snow Surveys*, 1941, pt. 1, pp. [4]; pt. 2, Mar. 1, pp. [8]; pt. 2, Apr. 1, pp. [29]; 1942, pt. 1, pp. [4]; pt. 2, Mar. 1, pp. 14; pt. 2, Apr. 1, pp. 28).

Nevada cooperative snow surveys—eastern slope, central Sierra Nevada: Comparison of forecast and actual results, 1940, H. P. BOARDMAN, G. G. DEVORE, and L. SANFORD (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 141–142).—The authors conclude that whenever a winter brings considerable rain during the usual months of snowfall, it will be worth while to supplement the snow survey analysis with an examination of available U. S. Weather Bureau winter precipitation records, and if there is a notable excess of precipitation in percent of normal over the snow survey, to make a quantitative estimate of the excess, also taking into account the winter run-off and its relation to normal.

The Humboldt Basin, Nevada: Two unusual years, 1940–41 and 1941–42, J. E. CHURCH. (Nev. Expt. Sta.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 156–159).—In the 1940–41 season relatively light snowfall occurred (71.4 percent of normal in March) but precipitation rose to double the normal in April and remained high through the period April–June. In 1941–42 an accumulation of low-level snow, suddenly melted by high temperature, combined with the preceding year's saturation to result in a flood. These unusual phenomena are considered in relation to run-off forecasting.

Test of snow-sampling tubes of large and small diameter, B. C. GOODELL and K. L. ROBERTS. (U. S. D. A. et al.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 151–152).—Under the conditions encountered in a test by the Northeastern Forest Experiment Station at New Haven, Conn., the small Mount Rose type of equipment proved to be more practical than the large tube and scales and just as accurate. There is no indication that the larger tube would show any significant advantage to outweigh its disadvantages. Tubular scales with a capacity of about 30 in. (inclusive of the tube weight) and reading to quarter-ounces to improve the accuracy of moisture content determinations in snow of moderate depth may prove useful.

A new design for a canvas case to carry snow-survey tubes and accessories, P. S. COWGILL and C. ELGES. (Nev. Expt. Sta. et al.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 148–150, figs. 3).—The authors note that the making of the aluminum tubes in short sections has helped materially, but a convenient carrying case has yet to be supplied. The case shown can be carried on the back by itself or fastened across a knapsack. The entire outfit, including balance, tape, cleaning hook, etc., is contained in one case. Since there is often no need of more than 10 ft. of tube, the case is made in two units, each holding four sections.

SOILS—FERTILIZERS

[Soil and fertilizer work in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 10, p. 3).—Brief statements of work at the substations on soil fertility and maintenance, sources and rates of nitrogen, and the value of legumes for maintaining soil fertility are presented by C. Dorman.

[Soil investigations by the Ohio Station] (*Ohio Sta. Bul.* 617 (1940), pp. 10, 12–13, 18, 69, 70–71, fig. 1).—This report notes a new method to measure

soil moisture, standardization of soil colors by whirling disk method, a new device to indicate when irrigation is needed, unprofitableness of tile drainage on some soils, need of Paulding County soils for organic matter, and superiority of timothy meadows on fertile soil.

[Soil investigations by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1941], pp. 36-38, 40-41).—Progress is reported on the development of a laboratory method for determining available magnesium. Partial sterilization of the soil with chloropicrin, which has a marked effect on microbiological activity, did not entirely overcome the effect of the preceding crops. When various permutterite and demineralite [aniline black] complexes were added to sand in glazed pots, treated with various concentrations of essential ions in a common culture solution and planted with red kidney beans and soybeans, the growth produced was proportional to the amount of ions present.

A microscopic method of studying soil structure, C. L. W. SWANSON. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 16 (1942), No. 3, pp. 379-389, figs. 10).—An apparatus is described in detail which was made to provide for a quick and easy tracing of projected microscopic images of soil in the natural state as observed in thin sections. The images provided for the comparison of pore spaces on the basis of shape, size distribution, and volume. Tracings of projected images are given for Marshall and Shelby silt loam profiles. The porosity of the Marshall was much greater throughout the whole profile than that of the Shelby. In a comparison of cultivated and virgin land the virgin soil was found to have twice the volume of pores and a higher percentage of large pores than the cultivated soil.

Studies of clay particles with the electron microscope.—II, The fractionation of beidellite, nontronite, magnesium bentonite, and attapulgite, C. E. MARSHALL, R. P. HUMBERT, B. T. SHAW, and O. G. CALDWELL. (Mo. and Ohio Expt. Stas.). (*Soil Sci.*, 54 (1942), No. 2, pp. 149-158, figs. 12).—In the second paper of this series (E. S. R., 87, p. 24) the authors show that the use of the electron microscope throws considerable light on the meaning of mechanical analysis within the clay fraction (below 2μ). In some cases, notably Putnam clay (a beidellite), fractionation down to very small sizes appears to have real meaning. The larger particles do not appear to be orientated aggregates of small particles, and their compact character suggests that considerable shearing force would have to be employed within the suspension in order to break them down. The nontronite and magnesium bentonite contained a predominance of aggregates in the coarser fractions, and if complete dispersion had been effected most of the material would have fallen in the finer fractions. In these cases, therefore, slight variation in the method of dispersion might cause notable changes in the mechanical analysis figures. Attapulgite represents an extreme example of this tendency, since the finer particles result entirely from cleavage of larger units. Other details of micromorphology beyond the resulting power of microscopes utilizing either the visible or the ultraviolet wave lengths are shown in electron micrographs, and their significance is discussed.

The composition of soil colloidal clay, D. I. SIDERT and A. N. LIAMINA (*Soil Sci.*, 54 (1942), No. 2, pp. 83-100, figs. 2).—A method for the fractionation of colloidal clay is described, on the basis of which suspensions of clays belonging to the Quaternary depositions of the Russian plain have been studied by X-ray, chemical, and thermal methods.

The chief component of these clays was found to be a mineral, of the formula $3\text{SiO}_2 \cdot \text{Al}_2\text{O}_3 \cdot 0.5 (\text{KII}) \text{O} \cdot \text{H}_2\text{O} + \text{bound H}_2\text{O}$, resembling the sericitelike mineral par-montmorillonite. In its properties this mineral occupies an intermediate place between the minerals kaolinite, sericite, and a mineral of the same composition as montmorillonite. It differs from the last-named mineral in some important

characteristics, however. The sericitelike mineral described here is considered a mixture of ~ 33 percent sericite+63 percent paramontmorillonite+4 percent kaolinite. The sericitelike mineral of Grim¹ may be regarded, in turn, as a mixture of 38 percent paramontmorillonite+62 percent sericite with little or no kaolinite. The character of the mixture, as well as the kind of the mineral designated as paramontmorillonite, may be established only after further study of clays that have been prepared carefully for analysis.

Some physical properties of the B horizons of Piedmont soils, T. S. COLLE (*Soil Sci.*, 54 (1942), No. 2, pp. 101-103, fig. 1).—From three soils the author obtained undisturbed samples of B horizons in the field by the use of a sampling cylinder (E. S. R., 76, p. 158) having a diameter of 5 in. and a depth of 2 in. The field samples were allowed to soak in water for 2 weeks, after which the excess soil was removed and measured as the volume percentage of swelling. The volume-weight, shrinkage on drying, percentage of clay (particles less than 2μ in diameter), and the moisture equivalent minus the xylene equivalent were also determined.

Influence of low recessional moraines on soil type pattern of the Mankato drift plain in Iowa, C. S. GWYNNE and R. W. SIMONSON. (Iowa Expt. Sta.). (*Soil Sci.*, 53 (1942), No. 6, pp. 461-466, figs. 3).—The authors show that the distribution of soil types in many parts of the Mankato lobe in Iowa shows a banded pattern of annual recessional moraines. Clarion soils, members of the Prairie group, occupy the low but well-drained swells, whereas Webster soils (Wiesenboden) have been formed in the intervening swales where natural drainage was restricted. The low recessional moraines, which could be identified readily from the study of aerial mosaics, range up to 600 ft. in length, with long axes tending to parallel the outer edges of the lobe. The similarity in pattern of moraines and soil types is shown to be evident from a comparison of aerial mosaics and recent soil maps for counties in north-central Iowa.

It is pointed out that the relation between soils and low moraines in north-central Iowa may exist in other glaciated regions in an early stage of the erosion cycle. Recognition of the pattern of moraines should be helpful in the mapping of soils, and conversely, the soil maps may be helpful in the study of surface geology.

[Soil Survey Reports, 1935 and 1936 Series] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1935, No. 22, pp. 68, pls. 3, figs. 2, map 1; 1936, Nos. 14, pp. 68, pls. 6, figs. 3, map 1; 15, pp. 125, pls. 5, figs. 4, map 1; 17, pp. 93, pls. 3, figs. 2, map 1; 19, pp. 60, pls. 4, fig. 1, map 1*).—These surveys were made in cooperation with the State experiment station as respectively noted: 1935, No. 22, Tulsa County, Okla., E. W. Knobel et al. (Okla. Expt. Sta.); 1936, No. 14, Seneca County, N. Y., C. S. Pearson et al. ([N. Y.] Cornell Sta.); No. 15, Roane County, Tenn., M. E. Swann et al. (Tenn. Sta. et al.); No. 17, the Wasco area, Calif., A. C. Anderson et al. (Calif. Sta.); and No. 19, Madison County, N. C., E. F. Goldston et al. (N. C. Sta. et al.).

Water-permeable jacketed thermal radiators as indicators of field capacity and permanent wilting percentage in soils, C. N. JOHNSTON. (Univ. Calif.). (*Soil Sci.*, 54 (1942), No. 2, pp. 123-126, figs. 2).—Work with Bouyoucos' plaster electrical conductors (E. S. R., 83, p. 307) suggested that if the heater element in the soil were given a covering of porous material that would have its own moisture-holding characteristics, this jacket would absorb the heat emanating from the heater coil, making the resulting readings a function of the moisture content of the jacket and eliminating the contact difficulties between soil and elements that arise when nonjacketed heaters are used. Plaster of paris was cast as a concentric jacket $\frac{1}{8}$ in. thick about the 15-mm. glass tubes

¹ Jour. Amer. Ceramic Soc., 19 (1936), No. 11, pp. 307-315.

upon which the heater wires had been wrapped. A winding of No. 40 enameled copper wire, noninductively arranged as in resistance box coils, was used, and resistance changes were followed by means of a Wheatstone bridge. The heater elements were tested in Yolo fine sandy loam and in Holland fine sand. Despite the very different soil moisture percentages for the limits of field capacity and permanent wilting percentage in the two soils, comparable readings resulted, indicating that the plaster-jacketed heater may be applied to other soils with some prospect of obtaining readings similar to those here recorded for permanent wilting percentage and field capacity moisture contents. The plaster of paris jacket appears to be able to adjust itself to comparatively rapidly changing moisture content in the soil in the pots and should, therefore, be suitable for use in the field.

An automatic self-recording infiltrometer, D. D. PITTMAN and H. KOHNKE. (Ind. Expt. Sta. coop. U. S. D. A.). (*Soil. Sci.*, 53 (1942), No. 6, pp. 429-434, figs. 4).—Water is applied to the ground from a tank which rests on the balance of a recording rain gage. The water passes through a rubber hose to a plat which is enclosed by a steel frame 3 in. high, of which one-half is driven into the ground to check surface runoff. The decrease in weight of the tank, representing the infiltration that has occurred, is recorded on the chart of the revolving clock drum. The area to which water is applied from the tank is a square 7.09 in. on the side, the same as that of the 8.00-in.-diameter rain gage catchment, so that gage readings are direct in inches of infiltration.

A continuous record of infiltration, showing any change of rate when it occurs, is obtained automatically and is not subject to errors of the operator. The infiltration run can be extended over several hours, or until 6 in. of water have been applied. Many experiments can be performed in a relatively short time, allowing study simultaneously of the infiltration rate of two similar sites that differ essentially only in one plant or soil factor. The operation is simple. The expenses for procurement and operation are low in comparison with those for the sprinkler-type infiltrometers. For the transportation of two outfits and the necessary water a half-ton pick-up truck suffices.

The authors note the following limitations: (1) The area of the infiltration plat is small; therefore, sideward movement of water and air in the soil may tend to increase infiltration rates. This effect is partly compensated by buffer plats. (2) No attempt is made to simulate natural rainfall.

The thermal conductivity of dry soil, W. O. SMITH. (U. S. D. A.). (*Soil Sci.*, 53 (1942), No. 6, pp. 435-459, figs. 6).—Methods for cutting large monolith samples are given, and measurements of thermal conductivity on monolith samples cut by these methods from Miami silt loam (Indiana), Miami silty clay loam (Michigan), and Chester loam (Maryland) are reported. These show wide variation, depending on the structure present. Data for these samples when reduced to the finely fragmented state are also given. The thermal conductivities, except for granular structures, are considerably decreased when the soils are thus comminuted. Approximate expressions for the calculation of the thermal conductivity of a dry soil were developed. These require for their use in natural soils specific data regarding the porosity (determined usually from field volume weights and textural density), the soil structure, and the respective thermal conductivities of the soil solids and fluids. The influence of structure on thermal resistance is discussed and an index α (thermal structure factor) established for measuring its effect. This index depends on the type, class, and grade of structure.

Granular structured horizons were found to have about the same conductivity in both the natural and the finely divided states. Mechanical reduction as usually done in the laboratory has little effect on ordinary granular structures. The

thermal conductivity of most other structure patterns differs greatly from that observed in the finely fragmented condition, and in some cases it may be twice that observed in the comminuted state. Thermal resistance was found dependent on the architecture of the pore space and, in particular, on the component of the pore space included within the thermal paths through the soil solids. It appeared to depend both upon the textural and the secondary pore spaces. So far as the secondary pore space is concerned, the dependence is on the structural, if the soil is natural and structured; if it is in the mechanically fragmented state, the dependence is on that between the fragments. The component of the secondary pore space included within the thermal paths through the soil solids differs significantly in each type of secondary pore space, hence the thermal resistance and, therefore, the conductivity, are generally different in each of these states.

Some factors of the hydrology of the Sierra Nevada foothills, P. B. ROWE. (U. S. D. A. and Univ. Calif.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 90-100, figs. 17).—The size of the area, the character, intensity, and duration of the precipitation, and the moisture content of the soil were found, because of their influence on infiltration, surface runoff, erosion, and water yield, to be important factors in the hydrology of the Sierra Nevada foothills. The undisturbed vegetation cover of the woodland chaparral type, by protecting and maintaining soil conditions favorable to the development of high infiltration capacities, is effective in the control of surface runoff, erosion, and floods. A natural cover of woodland chaparral vegetation, by decreasing surface runoff and erosion and by serving to regulate and prolong stream flow from the area, at little or no reduction in the quantity of water yield, is highly beneficial in the production of usable water.

A 100-year record of Truckee River runoff estimated from changes in levels and volumes of Pyramid and Winnemucca Lakes, G. HARDMAN and C. VENSTROM. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 71-90, figs. 5).—Pyramid and Winnemucca Lakes receive and evaporate the waters of Truckee River, hence fluctuations in the levels and volumes of the lakes afford a means of measuring variations in the volume of water discharged into the lakes by this river. The history of the fluctuations in the lake levels and volumes from the discovery of Pyramid Lake in 1844 by J. C. Fremont to 1939 is traced. A considerable part of the runoff of Truckee River has been used for irrigation within the basin or diverted to points outside it. These deductions from the quantities of water which would have reached Pyramid Lake under natural conditions were calculated and added to the volumetric changes in the lakes. A record of runoff of Truckee River for the period of study was prepared by distributing the volumes of water in the lakes into annual seasonal discharges.

Drainage in the San Joaquin Valley as it may be affected by the Central Valley project, W. W. WEIR. (Calif. Expt. Sta.). (*Amer. Geophys. Union Trans.*, [22] (1941), pt. 1, pp. 45-49).—As a result of a proposed new source of gravity irrigation water the author expects an entirely new drainage problem to arise in a California area (Contra Costa County) in which there has been no previous irrigation. Elsewhere old drainage situations, now partially alleviated by extensive pumping, will be aggravated to the point where they will again become serious. New lands, or lands heretofore dependent solely on pumped water, will be safe under any normal procedure. The whole drainage problem, however, could be solved by everywhere withholding late-season gravity water to an extent such that 25 or 30 percent of the annual requirement would continue to be pumped from deep wells.

Effects of wind erosion on the composition and fertility of some Alberta soils, R. L. ERDMAN (*Sci. Agr.*, 22 (1942), No. 9, pp. 533-545, figs. 5).—As a

comparison of conditions for wind erosion, records are presented of winds in southern and southeastern Alberta where they were found to be about 20 percent higher than at two points in the Dust Bowl of the United States. Pot experiments with wheat comparing eroded and noneroded soils revealed that fine sand soil had been seriously damaged in productivity by erosion. Silt loam soil showed smaller injury, while loam and clay soils studied indicated no decrease in productivity. Chemical analyses indicated marked losses in fertility in coarse-textured soils, these amounting to losses of from one-third to one-half of the nitrogen and the organic matter. In medium-textured soils losses were about 15 percent in nitrogen and organic matter as a result of wind erosion. The fine-textured soils showed a percentage loss similar to that found in the medium-textured soils. Analyses of the dust samples indicated that they were about twice as high in nitrogen and organic matter as cultivated surface soils from adjacent areas.

A medium for the rapid cultivation of soil actinomycetes, E. J. BORTCHER and H. J. CONN. (N. Y. State. Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 1, p. 137).—Because of the importance of soil actinomycetes in the production of antibiotic substances, attention has been directed toward the finding of a substitute for agar which would be a more satisfactory medium for the growth of the organisms. Materials investigated included sand, glass beads, gypsum blocks, and cotton. Of the above materials, cotton proved to be the most satisfactory. The advantage of cotton is that it can be saturated with a culture fluid, and although it does not form a gel, it gives the organisms a point of attachment and allows good aeration.

Are there obligate cellulose-decomposing bacteria? R. Y. STANIER (*Soil Sci.*, 53 (1942), No. 6, pp. 4:9-480).—By substituting a sterilization by filtering for the heat sterilization previously used, the author was able to provide experimental conditions such that the three species *Sporocytophaga myxococcoides*, *Cytophaga hutchinsoni*, and *C. rubra* all grew excellently in a mineral medium with filtered dextrose as the sole carbon source in quantities ranging from 0.1 to 0.5 percent. The filtered dextrose did not exert a toxic effect on growth in the presence of cellulose, although with the higher concentrations of dextrose the attack on the cellulose was diminished, apparently because of a preferential utilization of the monosaccharide evidenced by abundant growth in the liquid. The similarity in the rates of cellulose, cellobiose, and dextrose oxidation by *C. hutchinsoni* indicates that cellulose is decomposed by an initial break-down to, and subsequent oxidation of, the constituent monosaccharide.

Nitrogen fixation by *Azotobacter* in association with other bacteria, C. J. LIND and P. W. WILSON. (Univ. Wis.). (*Soil Sci.*, 54 (1942), No. 2, pp. 105-111).—In the use of a medium in which the readily available iron was not optimum because of an unsatisfactory preparation of iron humate, an aerobic spore-former isolated as a contaminant from a culture of *A. vinelandii* markedly stimulated nitrogen fixation by this organism. Under these conditions fixation by the *Azotobacter*, although good and decidedly higher than most values found in the literature, was not maximum. The two species could be continuously grown together without the contaminant dominating the population and consequently reducing the nitrogen fixed. The same results were obtained by mixing pure cultures of the contaminant with strains of *Azotobacter* at the beginning of an experiment. Attempts to replace this contaminant by other aerobic spore-formers, by rhizobia, and by other nonsporeformers were unsuccessful. Stimulation of nitrogen fixation was also obtained with a mixed culture of *A. vinelandii* and *Clostridium pasteurianum* under conditions in which appreciable nitrogen fixation by the latter would not be expected. When a new preparation of humate

was used or additional iron was supplied the old preparation, the stimulation was no longer evident.

Influence of potassium chloride on nitrification in Bedford silt loam, B. E. HAHN, F. R. OLSON, and J. L. ROBERTS. (Ind. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 2, pp. 113-121).—The critical concentration of potassium chloride for measurable inhibition of nitrification in Bedford silt loam at 66 percent of water-holding capacity was found, in laboratory experiments, to occur between 190 and 380 p. p. m. Nitrite formation, but not nitrate formation, was inhibited by potassium chloride. The chloride ion was found to be responsible for the inhibition.

The neutralization of acid-forming nitrogenous fertilizers in relation to nitrogen availability and soil bases: A report of Windsor lysimeter series D, M. F. MORGAN, H. G. M. JACOBSON, and O. E. STREET. (Conn. [New Haven] Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 2, pp. 127-148).—Comparisons of the effects of ammonium sulfate, urea, and cottonseed meal, both with and without neutralization of theoretical acid production, and of sodium nitrate, applied to two soils differing in their initial base status, were made in lysimeter tanks without crop. Annual treatments of 200 lb. of nitrogen per acre in these materials were applied in combination with other materials supplying equal amounts of other constituents, except as required to adjust the acidity.

The nitrates supplied as sodium nitrate were almost entirely leached from the surface soils used in the tanks within from 6 weeks to 4 mo., depending upon the conditions of summer rainfall occurring during the 5 yr. of these trials. The rate of nitrification of the other materials was accelerated by the neutralizing treatments, as evidenced by the early leaching of larger proportions of the total annual nitrate production. The lime-adjusted urea treatment showed particularly high acceleration of nitrification on the less acid soil. The transformation of ammonia to nitrates under the fully acid ammonium sulfate treatment was definitely retarded, particularly on the more acid soil. Neutralizing one-half of the potential acidity of this treatment considerably favored nitrification. Cottonseed meal was more slowly nitrified than urea, both with and without neutralization, on both soils. The total measurements of nitrates and ammonia nitrogen in the drainage water indicated a greater capacity for nitrate production on the more acid soil in most comparisons. Nitrate production from ammonium sulfate was definitely increased by partial neutralization. On the other hand, when this material was fully neutralized in applications to the less acid soil, the considerably decreased nitrogen recovery suggested that some losses of ammonia to the atmosphere may have been engendered at a soil reaction approaching the neutral point. Measurements of nitrogen in the soil at the end of the experiment supported this view. The neutralized urea treatment showed a similar tendency. Ammonia nitrogen was leached in considerable amounts from sandy surface soils used in this experiment in years when heavy rains occurred early in the season. Such ammonia losses were chiefly from the ammonium sulfate and urea treatments. They were smaller when these materials were neutralized. The less acid soil, although slightly more sandy, did not leach as much ammonia for corresponding treatments. Since both soils liberated a considerable amount of nitrogen without additions of this element in the treatment, the total leachings of nitrogen produced net losses from the soil during the 5-yr. period in most instances. From lysimeter data, cottonseed meal treatments should have produced small net gains of soil nitrogen in all comparisons. The soil analyses indicated some nitrogen losses, even under this treatment, but these were of smaller magnitude than with the other nitrogen fertilizers.

Considerable amounts of the calcium added in the neutralizing treatments

were not represented in the leaching. Most of this apparent residue was not accounted for in measurements of the exchangeable calcium of the soils at the conclusion of the experiment. On the other hand, net losses of calcium under the acid treatments were similarly evidenced by both leaching and soils data. This was also true of magnesium. Except under the sodium nitrate treatments, potassium losses by leaching were of much smaller magnitude than the decreases in exchangeable potassium. Other leachings were closely in line with the amounts supplied in the treatments, except for phosphorus, which did not leach. Acid nitrogen fertilizers caused considerable leaching of aluminum and manganese, particularly when applied to the more acid soil. After the first 2 yr. the fully acid ammonium sulfate treatment produced similar leachings of these constituents on both soils. The less acid soil had been previously treated with dolomitic lime. Hence, this soil leached more magnesium and less potassium for corresponding treatments, particularly in the earlier years of the experiment. Calcium leachings from both soils were of similar magnitude, although one was much more acid than the other.

Lysimeter data, pH measurements, and base-exchange studies all show the acid effects of ammonium sulfate, urea, and cottonseed meal upon both soils, except when fully neutralized with lime. The acid effects were more pronounced on the initially less acid soil, particularly from the fully acid ammonium sulfate treatment. The neutralization of approximately one-half of the potential acidity of this fertilizer gave similar results to those obtained from urea. Increases in acidity due to strongly acid nitrogen fertilizers were measured by net base depletion, by leaching, by decreases in exchangeable bases, and by increases in exchangeable hydrogen. These represented much smaller calcium carbonate equivalents than could be evaluated from the potential acidity of the treatment. After the soil becomes strongly acid, further applications of an acid-reacting fertilizer produce but slight effects upon the base status of the soil. On the other hand, lime applied in quantities equivalent to the acidity of the fertilizer serves to maintain the net base status of the soil at a fairly constant level, except when applied in connection with a less fully available nitrogen material, such as cottonseed meal. The use of a liming material in neutralizing acid nitrogen fertilizer produces a change in the distribution of the various exchangeable bases. Thus, in this experiment, an acid soil treated with "neutral" fertilizers for 5 yr. was made much more productive for alfalfa, a result believed to be associated with the changed proportions of the various bases.

Plant symptoms of boron deficiency and the effects of borax on the yield and chemical composition of several crops, G. R. MUIR. (Mich. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 1, pp. 55-65, figs. 5).—Sugar beets, canning beets, mangels, radishes, chicory, rutabagas, turnips, barley, wheat, corn, and dandelions were grown either on a boron-deficient soil or on boron-deficient quartz sand, and on similar substrates to which borax had been added, to determine boron-deficiency symptoms and to provide normal and boron-deficient plant tissue for chemical analysis.

An insufficient supply of boron for root crops was evidenced by the distortion and premature death of the central leaves, by the formation of numerous small leaves, and by a break-down of the root tissue cells. The formation of corky tissue, sloughed-out areas (cankers), and water-soaked areas (brown heart) accompanied or followed the break-down of the root tissue cells. Barley, wheat, and corn matured later and failed to develop seeds normally when boron was lacking. Dandelions with an insufficient supply of boron failed to bloom. The tissue of plants inadequately supplied with boron contained, in most cases, higher percentages of calcium, nitrogen, magnesium, and iron than the tissue

of plants grown in the presence of sufficient boron. The greatest differences in composition occurred in the contents of nitrogen and iron. The potassium content was not greatly altered by the plants' response to boron. Borax applied to the soil in all cases increased the boron content of the plants. Plants with characteristic boron-deficiency symptoms were relatively low in boron content.

Occurrence of soluble selenium in soils and its availability to plants. O. E. OLSON, E. I. WHITEHEAD, and A. L. MOXON. (S. Dak. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 1, pp. 47-53, fig. 1).—Soils and plants from 32 locations within a small seleniferous area (in sec. 2, T. 107 N., R. 78 W., South Dakota) were analyzed for total selenium. Some of the soils were analyzed also for soluble selenium. The results indicate that in the region specified the second and possibly the third foot of soil are the important source of selenium available to plants, and that the top foot of soil is, in general, relatively unimportant. Most of the soluble selenium was found to occur as selenates, but selenites appeared also to be present in the soils. The data obtained indicate that highly seleniferous soils may be formed by the removal of soluble selenium from seleniferous rock and its redeposition in materials of relatively low selenium content.

Response of cos or romaine lettuce to chloropierin soil treatment, phosphate, and lime. J. B. SMITH and F. L. HOWARD. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 552-556, fig. 1).—Soil treatment with chloropierin, used at the rate of 5 cc. per cubic foot of soil prior to cropping, was compared with soil acidity, phosphate levels, manure, boron, and magnesium to determine the effect of soil fertility on crop yield. The authors point out that soil may be producing below its capacity because the effects of injurious and competitive micro-organisms have not been given due consideration. The chloropierin treatment is reported as having removed the major factors inhibiting vegetable growth. Large applications of phosphate with the chloropierin treatment gave the greatest response. The effect of difference in acidity (pH 5.3-5.5 compared with pH 6.1-6.3) on vegetative growth is decreased as greater amounts of phosphate are added, or the greater the phosphate level in the soil the less acidity acts as a limiting factor of growth. Chloropierin soil treatment gave at least a doubling of the yield and brought a proportionally greater growth response at the lower phosphate levels than at the higher.

Agronomic value of kitchen waste. M. M. MCCOOL. (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 5, pp. 345-358, figs. 2).—Results of greenhouse and field experiments are given on the soil-improving value of air-dried and ground samples of kitchen waste. In greenhouse tests the waste was found to be less effective for the first crop than tankage and to be superior to cow manure and shredded stockyard manure, when compared on the basis of the addition of equal amounts of nitrogen to the soil cultures. Residual effects were greater than were those from tankage and the manures employed. The addition of small amounts of sodium nitrate was effective in reducing the time required for response after planting. In a field test with sweet corn, waste comprised of a mixture from different sources was superior to stockyard manure. Availability of the waste was not increased by incubating with material from active composts. Incubation, however, was considered by the author to be practicable when one considers changes in color, structure, loss of obnoxious volatile materials, and the large decrease in water content during decomposition.

AGRICULTURAL BOTANY

Plant material introduced by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, April 1 to June 30, 1937 (U. S. Dept. Agr., *Inventory 131* (1942), pp. 55).—This number lists 1,284 lots of plant material with descriptive notes in many cases.

A modern classification of the plant kingdom, O. TIPPO. (Univ. Ill.) (*Chron. Bot.*, 7 (1942), No. 5, pp. 203-206, fig. 1).—Knowing of no general modern classification reflecting the newest sound developments in all branches of plant phylogeny and in which the various groups are named in such a way as to indicate rank or degree of affinity and in which the various group names are brought into conformity with the system used by zoologists, the author has assembled and here presents a classification which he has found useful and which he believes may be of interest to other botanists, especially teachers of botany.

Plant life: A textbook of botany, D. B. SWINGLE (New York: D. Van Nostrand Co., [1942], 2. ed., pp. XVI+457, [pl. 1], figs. 295).—Without sacrificing the technical material and in response to student interest, this edition introduces a little more "natural history" than was found in the first (E. S. R., 73, p. 593).

Tabular keys for identification of the woody plants, F. B. ROBINSON (Champaign, Ill.: Garrard Press, [1941], pp. [4]+156). This set of keys has been evolved for use of students and others interested in studying and identifying the more used woody plants of the Northern States and Canada in the field and includes 500 trees, shrubs, and vines. Separate keys are provided for trees, shrubs, vines, conifers, and broad-leaved evergreens in leaf and in winter.

Medicinal plants: Native and naturalized plants of Virginia which have been officially used in the preparation of drugs, A. B. MASSEY (Va. Polytech. Inst. Bul., 35 (1942), No. 13, pp. 52, figs. 15).—Based on a general survey of the State and data already in hand, this contribution was prepared in answer to the many requests as to what native plants are of value, and how to market them, among the approximately 140 species found in Virginia which have been officially used in medicine. For each plant its occurrence in Virginia, data on collecting and preparing the crude drug, and a brief description are presented.

The uptake of ions by bacteria, T. M. MCCALLA and V. D. FOLTZ. (Kans. Expt. Sta.) (*Kans. Acad. Sci. Trans.*, 44 (1941), pp. 46-47).

Dissimilation of phosphoglyceric acid by Escherichia coli, M. F. UTTER and C. H. WERKMAN. (Iowa State Col.). (*Biochem. Jour.*, 36 (1942), No. 5-6, pp. 485-493, figs. 3).

Dissimilation of pyruvic acid by cell-free preparations of Clostridium butylicum, H. J. KOEPEL and M. J. JOHNSON. (Wis. Expt. Sta.) (*Jour. Biol. Chem.*, 145 (1942), No. 2, pp. 379-386, figs. 3).—The authors describe the preparation of a vacuum-dried cell-free water extract from frozen cells of *C. butylicum* which catalyzes the fermentation of pyruvic acid to acetic acid, CO₂, and H₂, the reaction being most active at pH 6.5. There are 19 references.

The bacterial oxidation of rubber, C. E. ZOBELL and C. W. GRANT. (Univ. Calif.). (*Science*, 96 (1942), No. 2495, pp. 379-380).—Besides demonstrating that neither synthetic nor pure India rubber is biologically inert and proving that rubber-oxidizing micro-organisms occur fairly abundantly in nature, the studies reported suggest that such forms may play an important role in the deterioration of rubber products, especially those exposed to moisture. Not only species of *Actinomyces* and *Proactinomyces*, but also of *Mycobacterium* and *Pseudomonas*, were found capable of oxidizing rubber, and the aerial mycelium of an unidentified mold virtually enveloped the moist rubber on which it was growing and its substrate mycelium seemed to penetrate the rubber.

Flagella staining of anaerobic bacilli, E. O'TOOLE (*Stain Technol.*, 17 (1942), No. 1, pp. 33-40, figs. 14).—The technic described involves use of the flagella stain of H. D. Bailey² and careful attention to several details, the most important of which are listed.

² Soc. Expt. Biol. and Med. Proc., 27 (1929), No. 2, pp. 111-112.

A flagella staining technic for soil bacteria, P. J. FISHER and J. E. CONN. (N. Y. State Expt. Sta.). (*Stain Technol.*, 17 (1942), No. 3, pp. 117-121, figs. 5).—The flagella of many soil bacteria are so fine that they are difficult to stain by most methods, but the technic developed by the authors, combining the best points of the Hofer-Wilson method (E. S. R., 79, p. 456) with that of Bailey as developed by O'Toole (noted above), is reported to have given satisfactory preparations of bacteria of the genera *Pseudomonas*, *Phytomonas*, *Alcaligenes*, *Escherichia*, *Azotobacter*, and *Bacillus*. The method is recommended as a rapid and constant technic for routine staining of all motile aerobes.

The occurrence of actinomycetes of the genus *Micromonospora* in inland lakes, W. W. UMBREIT and E. MCCOY (In *A Symposium on Hydrobiology*. Madison: Univ. Wis. Press, [1941], pp. 106-114, fig. 1).

The carotenoid pigments of cryptogams, D. L. FOX. (Univ. Calif.). (*Chron. Bot.*, 7 (1942), No. 5, pp. 196-198).—A review of studies of these pigments in bacteria, fungi, and algae.

The occurrence and significance of marine cellulose-destroying fungi, E. S. BARGHOORN, JR. (*Science*, 96 (1942), No. 2494, pp. 358-359).—In this preliminary note the author reports the isolation of a series of marine fungi readily attacking wood and other cellulosic materials under marine conditions and shows them to be of very common occurrence along the North Atlantic coast.

The role of the aquatic fungi in hydrobiology, W. H. WESTON (In *A Symposium on Hydrobiology*. Madison: Univ. Wis. Press, [1941], pp. 129-151).—This is a general, critical review (59 references), presenting evidence that these fungi play a significant role in the complexly interwoven pattern of life in inland waters, and that they deserve more attention from limnologists.

A sporulation stock medium for yeasts and other fungi, E. M. MRAK, H. J. PHAEFF, and H. C. DOUGLAS. (Univ. Calif.). (*Science*, 96 (1942), No. 2497, p. 432).—An agar medium made from aqueous extract of carrots, beets, cucumbers, and potatoes induced sporulation and served as an excellent stock culture medium. Its preparation is described.

Nuclear behavior in the Mucorales.—I, The Mucor pattern, V. M. CUTTER, JR. (Cornell Univ.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 7, pp. 480-508, figs. 66).—Employing several techniques not known to have been used on the group previously, the nuclear behavior in nine species of the Mucorales is traced through all the life history stages. There are 31 references.

Spore dispersal in the Mucorales, C. G. DOBBS (*Nature [London]*, 149 (1942), No. 3786, p. 583).—A brief note.

Plant resources of Honduras, W. POPEHOE (*Chron. Bot.*, 7 (1942), No. 5, pp. 217-219).

Chaves para a determinação de gêneros brasileiros e exóticos das dicotiledoneas mais cultivadas no Brasil [Keys for determining the indigenous and introduced dicotyledons commonly cultivated in Brazil], L. J. BARROSO (*Bol. Soc. Brasil. Agron.*, 5 (1942), No. 2, pp. 173-182, pls. 3).—Genera of the Araliaceae, Urticaceae, Lorantheae, and Proteaceae are included here.

Eucalyptus: Contribución al conocimiento del eucalipto y de sus esencias, en la Provincia del Tungurahua [Eucalyptus: Contribution to the knowledge of eucalyptus species and their volatile oils in Tungurahua Province, Ecuador], A. CASTILLO V (*Bol. Inst. Bot., Univ. Cent. Ecuador*, 1 (1942), No. 1, pp. 125-159).

Indiana plant distribution records, II—1941, C. C. DEAM ET AL. (*Ind. Acad. Sci. Proc.*, 51 (1941), pp. 120-129).—This second in the series of distribution records¹ is intended to keep Deam's "Flora of Indiana" up to date.

¹ *Ind. Acad. Sci. Proc.*, 50 (1940), pp. 72-78.

Additions to the revised catalogue of Ohio vascular plants, X, C. H. JONES. (Ohio State Univ.). (*Ohio Jour. Sci.*, 42 (1942), No. 5, pp. 201-210).—This annotated list represents a majority of the new county and State records added to the State herbarium during the preceding year.

***Panicum bennettense*, a new species from North Carolina, W. V. BROWN** (*Bul. Torrey Bot. Club*, 69 (1942), No. 7, pp. 539-540, fig. 1).—This new grass was found in dry thickets in a savanna near Durham.

Revisionary studies in the Coryneliaceae, [I], II, H. M. FITZPATRICK. (Cornell Univ.). (*Mycologia*, 34 (1942), Nos. 4, pp. 464-488, figs. 43; 5, pp. 489-514, figs. 35).—These papers constitute a revision of the writer's earlier monographic treatment of the Coryneliaceae.⁴

Ecological problems of the southeastern United States coastal plain, B. W. WELLS. (Univ. N. C.). (*Bot. Rev.*, 8 (1942), No. 8, pp. 533-561).—The main body of this critical review considers salt-spray climaxes, aquatic and marsh communities, swamp forest, peat bogs, shrub bogs, white cedar bogs, savannas, longleaf pine fire subclimax, the problems of the sandhill climax and of longleaf pine forest management, coastal peat deposits, regional climatic climaxes, and Florida hammocks. In this survey nine well-defined major communities are described. In the differentiation of these the principal controlling conditions, aside from the over-all climatic factors, are the soil texture, as this controls water and nutrient (especially Ca), length of exposure to high-water table (hydroperiod), salt spray (near the coast), and fire, involving all except the aquatic. There are 63 references.

An ecological analysis of the plant communities of Piedmont, North Carolina, H. J. OOSTING (*Amer. Midland Nat.*, 28 (1942), No. 1, pp. 1-126, figs. 19).—A detailed knowledge of successional trends and the ecological structure of natural plant communities contributes materially to successful silvicultural practice and forest management. This monographic study was undertaken to serve as a foundation toward filling this need, viz. to determine for this area the natural groupings of plants with respect to their habitats and the changes in these communities with respect to time, to learn if possible why these communities occur as they do, and to determine possible plant indicators which would be satisfactory criteria for the character of the various habitats. There are 23 references, and an appendix lists the species mentioned in the text with their authorities, the common names used, and the life forms.

Lack of available phosphorus preventing normal succession on small areas on Bull Run Mountain in Virginia, H. A. ALLARD (*Ecology*, 23 (1942), No. 3, pp. 345-353, figs. 3).—In this area small local barren-soil spots occurring on abandoned cultivated land remain more or less destitute of normal vegetative cover for indefinite periods, appearing as naked spots surrounded by broomsedge, forbs, or the woody shrubs and trees which indicate the early stages of a climax woodland. Pot-culture and field-plot studies using additions of essential nutrient salts with various plants (tobacco, legumes, German millet, etc.) as indicators showed that these soils are lacking primarily in P and secondarily in N. Lack of sufficient available P has prevented a timely invasion by wild N-fixing legumes, so that these soils very slowly build up a sufficiency of such reserves and therefore remain practically devoid of a closed plant cover indefinitely. Reference is made to similar barren soils in Scotland (termed "scree"), and it is suggested that chemical deficiencies may be in part responsible for their origin also.

Ecological relations of plants with ants and termites, J. C. T. UPHOF (*Bot. Rev.*, 8 (1942), No. 9, pp. 563-598).—"An ecological relationship exists between plants and some species of ants and termites, insects that have reached a rela-

⁴ *Mycologia*, 12 (1920), Nos. 4, pp. 206-237, pls. 7; 5, pp. 239-267.

tively high degree of 'mental' and social organization." This monographic review (193 references) considers myrmecophytes, myrmecochores, ants and extrafloral nectaries, the fungus-growing habit among ants and termites, ant fungi, termite fungi, and different hypotheses regarding myrmecophily.

Infección de la alfalfa con "Rhizobium meliloti" en la Provincia de Santa Fe [Alfalfa infection by *R. meliloti* in Santa Fé Province, Argentina], E. SCHIEL and A. E. RAGONESE (*Rev. Argentina Agron.*, 9 (1942), No. 2, pp. 114-169, figs. 6; *Eng. abs.*, pp. 166-167).—This extended study is believed to be the first in Argentina dealing with the problem of inoculating alfalfa with pure cultures of the legume nodule organism, the purpose being to extend the practice throughout the Province, where field trials have shown benefits therefrom. The strains used are enumerated, laboratory methods (with suggested modifications) are reviewed, culture formulas are given, and the methods of obtaining pure cultures, sterilizing the seed, growing the seedlings aseptically, and inoculating the plants are detailed. It was found that inoculated seed must be sown as early as possible for best results, and that *Rhizobium* cultures kept in tightly closed tubes retain their virulence for at least 72 days in storage. For selecting the most efficient strains, field trials were conducted with those giving best results in the laboratory, after which those performing best in the field were employed as a polyvalent culture for further inoculations. Six field trials on common soils in three areas appeared to indicate the poor efficiency of local strains of *Rhizobium* as compared with those from outside sources, the better start of inoculated alfalfa, and the relative freedom from weeds with inoculated alfalfa. There are 27 references.

Studies on nitrogen fixation by blue-green algae.—I, Nitrogen fixation by *Anabaena cylindrica* Lemm., G. E. FOGG (*Jour. Expt. Biol.*, 19 (1942), No. 1, pp. 78-87, figs. 2).—*A. cylindrica* in pure culture free of bacteria was shown to fix N from the air. N fixation did not occur in the presence of a sufficient amount of readily available combined N.

The effect of auxins on protoplasmic streaming, III, B. M. SWEENEY and K. V. THIMANN (*Jour. Gen. Physiol.*, 25 (1942), No. 6, pp. 841-854, figs. 7).—Continuing the series (*E. S. R.*, 79, p. 460) and using a new method (described) for continuously recording the absolute rate of protoplasmic streaming in epidermal cells of the oats coleoptile, a study was made of the influence of malate and iodoacetate. In the presence of optimum concentrations of indole-3-acetic acid in freshly cut sections, malate had no effect on streaming, but under very low auxin concentrations it increased the range of response. Used alone, malate had no effect on streaming. When coleoptile sections were soaked overnight in sugar solution or water, the acceleration of streaming normally caused by auxin almost disappeared, but the presence of malate caused large accelerations of streaming by auxin. Similarly, in sections of old coleoptiles no longer showing acceleration of streaming by auxin, it was restored by adding malate with the auxin. The effect of iodoacetate was to inhibit the acceleration by auxin and not to affect the basal streaming rate. It is concluded that, just as for growth and respiration, malate is necessary for the response to auxin shown by acceleration of streaming. This further strengthens the triple parallel between the effects of auxin on streaming, growth, and respiration, all of which appear to be mediated by the 4-carbon acid system.

Plant biochemistry and physiology, R. NEWTON, N. H. GRACE, J. B. MARSHALL, and J. L. FARRAR (*Canada Natl. Res. Council Rev. Activ.*, 1941, pp. 14-15).—Brief progress notes are given on studies of plant growth factors, hormone treatment of seeds, plant hormone dusts in the propagation of stem cuttings, and propagation of forest trees from stem cuttings.

A pyrimidine analog of thiamine and the growth of fungi, W. J. ROBBINS

(*Natl. Acad. Sci. Proc.*, 28 (1942), No. 9, pp. 352-355).—The responses of *Phycomyces blakesleeanus*, *Pythiomyces gonapodyides*, and *Phytophthora cinnamomi* led to the following conclusions: The pyrimidine analog of thiamine does not replace thiamine in their physiology. Its effectiveness as a pyrimidine source for the first two fungi was of the order of 1/500 or 1/1,000 that of thiamine. The action of the analog as a pyrimidine source might be ascribed to the presence of traces of pyrimidine as an impurity or more probably to a slight dissociation into its constituents or to decomposition in sterilization. Neither of the first two fungi appeared able to split the compound and obtain pyrimidine from it. In this respect the pyrimidine analog differs from the pyridine analog studied earlier (E. S. R., 86, p. 452). The latter was about as effective a source of pyrimidine as thiamine.

Thiamine in some common American trees, P. R. BURKHOLDER and A. G. SNOW, JR. (U. S. D. A. et al.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 6, pp. 421-428, figs. 4).—The approximate thiamin activity as indicated by the *Phycomyces* assay of buds, leaves, and bark of some common American evergreen and deciduous trees as studied at different seasons of the year is presented. From some of the results obtained it seems possible that girdled trees may ultimately die from vitamin starvation of their root systems. There are 17 references.

The increase of B vitamins in germinating seeds, P. R. BURKHOLDER and I. McVEIGH (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 10, pp. 440-446, figs. 2).—Significant increases in concentration of riboflavin, niacin, biotin, and pyridoxine during germination are reported for many kinds of seeds. If the value of germinated seeds is to be judged by their vitamin content, it appears that the common use of sprouted seeds in the diets of orientals rests on a sound nutritional basis.

Vitamin C content of persimmon leaves and fruits, C. G. VINSON and F. B. CROSS. (Univ. Mo. and Okla. A. and M. Col.). (*Science*, 96 (1942), No. 2497, pp. 430-431).—Fresh leaves apparently contained about ten times as much vitamin C as the fruits. Tea made from the green leaves was pronounced very acceptable.

Variations in ascorbic acid and dry matter content of cowpea plants at different times of day, M. E. REID. (U. S. D. A. et al.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 7, pp. 522-527).—Progressive increases in ascorbic acid and dry matter were found to occur from the beginning of the daily light period and to continue during the day, depending on the carbohydrate-synthesizing power in the tissues. Plants grown under high illumination and much-limited food supply tended to have relatively large reserves of starch and sugars and low carbohydrate-synthesizing ability. Under favorable light such plants tended to have their maximum vitamin C values early in the day. Plants subjected to prolonged periods of cloudy weather, and especially with an abundant supply of mineral nutrients available, tended to have low vitamin C values and a low supply of starch and sugars. These results suggest that for best vitamin C values harvesting of vegetables should be done not before midforenoon following generally clear weather. If it must be done after cloudy weather, collection should be made as late in the day as possible.

The physiology of incompatibility in plants.—I, The effect of temperature, D. LEWIS (*Roy. Soc. [London], Proc., Ser. B*, 131 (1942), No. 862, pp. 13-26, pl. 1, figs. 9).—Two different genetic systems of incompatibility are known, viz, heterogamety and heterostyly, depending, respectively, on the genotype of the pollen grain and of its parent. Whether the two are physiologically related is unknown; the specificity of heterogamety indicates an immunity reaction. To elucidate their relationship the effect of temperature on pollen-tube growth was studied. Compatible pollinations of both systems exhibited increased growth rate with increased temperature until the lethal point was approached at about

35° C. Incompatible pollinations of both systems showed an optimum growth rate at 15°–20°. The physiological method of inhibition is therefore probably related, although its genetic basis differs. The different growth rates at different temperatures gave different total growth at inhibition, and at the most favorable temperature there may be no inhibition at all. There is therefore no specific inhibitory zone in the plants used, although elsewhere the top of the style may provide such a zone. Certain genotypes of *Oenothera orguensis* showed such powerful incompatibility that no temperature sensitivity could be discovered. This extreme modification is determined by the pollen parent's genotype, like the main action in heterostyly. In heterostyled plants thrum pollen has to grow down the longer pin style, being adapted in two ways: In *Primula* it is larger and in *Linum grandiflorum* it has a higher osmotic pressure. In either case, presumably, it has the higher dry weight. In two heterostyled *Primula* spp. thrum pollen grows faster down the long-pin style than pin pollen does down the short-thrum style. However, in the illegitimate matings thrum pollen is more strongly inhibited. There is therefore a differentiation of the mechanisms adapted to secure equal regularity of cross fertilization of the two types. There are 18 references.

Sand culture methods, F. M. EATON. (Tex. Expt. Sta.). (*Chron. Bot.*, 7 (1942), No. 5, pp. 200–201). A brief critical discussion of methods in the light of recent work by the author and others (9 references).

The mineral pattern of stems from vegetative and flowering plants as determined by microincineration, B. E. STRUCKMEYER. (Wis. Expt. Sta.). (*Science*, 96 (1942), No. 2493, p. 346).—Seeking a fixative which would neither dissolve nor add mineral substances to the ash, the author found absolute alcohol alone or 9 parts in 1 of formalin, cellosolve, and dioxan satisfactory, though the last seemed to have a shrinking effect on the stem material. In an attempt to prevent this shrinkage, "Nevillite 123" proved best suited of several adhesives tried. By these methods the amount and pattern of the ash in the vegetative and flowering stems of several widely separated plant species were found to differ, the greatest difference in amount occurring in the internodes closer to the stem tips. In plants initiating flower primordia under short days, there was also more ash in stems under short- than under long-day treatment.

Accumulation of salt and permeability in plant cells, D. R. HOAGLAND and T. C. BROYER. (Univ. Calif.). (*Jour. Gen. Physiol.*, 25 (1942), No. 6, pp. 865–880, figs. 4).—Under conditions favorable for aerobic metabolism comparisons were made of concentrations of K and Br in exudates of barley roots and in expressed sap from the roots, both methods leading to the same general viewpoint on the metabolically governed transport of solutes by living plant cells. Cyanide in low concentration prevented salt accumulation by barley roots, and methylene blue, without decreasing CO₂ production by roots, destroyed the power of salt accumulation. Even with an inward gradient of ionic concentration, K and Br ions entered roots only to a slight extent under an anaerobic condition. Under aerobic conditions lactate or alcohol failed to prevent salt accumulation by root cells. Tests on fluids obtained by suction from tomato roots gave evidence of loss of salt-accumulating power under the influence of N₂ or CO₂ gases, together with probable effects on cell permeability. Using radioactive isotopes on *Nitella* cells, Br gradually moved into the vacuolar sap until the concentration appeared to exceed that of the protoplasm. Accumulation of salt in the vacuole did not occur anaerobically. Some views on the interrelations of permeability, salt accumulation, and metabolism are suggested for further consideration.

The availability of certain forms of organic phosphorus to plants and their dephosphorylation by exo-enzyme systems of growing roots and by

soil catalysts, H. T. ROGERS (*Iowa State Col. Jour. Sci.*, 17 (1942), No. 1, pp. 108-110).—Abstract of thesis.

A study of some factors affecting the nitrate content of plants, E. I. WHITEHEAD and O. E. OLSON. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 67-72).—Molybdenum was definitely toxic to Richland oats seedlings, arsenic stimulated growth up to 0.25 p. p. m. but became increasingly toxic above this concentration, manganese stimulated growth and Mn-deficient solutions gave rise to plants extremely high in nitrate, droughty soil conditions increased the nitrate concentration of the plants but at soil moistures exceeding 25 percent the nitrate content was low and apparently constant, and plants receiving continuous light had lower nitrate concentrations than those receiving daylight only. Wherever the KNO_3 content increased there seemed to be a corresponding decrease in plant growth, apparently indicating a correlation between nitrate concentration and the protein synthesis rate.

End products of nitrogen metabolism in plants, H. B. VICKERY (In *Biological Symposia*, V, edited by J. CATTELL. Lancaster, Pa.: Jaques Cattell Press, 1941, vol. V, pp. 3-19).

The organic acids of the leaves of Bryophyllum calycinum, G. W. PUCHER. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 145 (1942), No. 2, pp. 511-523).—Examination of the organic acids extracted by warm water from a dried leaf sample indicated it to contain at least 8 percent of the dry weight (probably more) of isocitric acid, together with about 7 percent of l-malic acid and 2 percent of citric acid. This plant is said to be by far the richest source of isocitric acid hitherto encountered, and attention is called to the theoretical implications of this observation. There are 19 references.

Quinoa (Chenopodium quinoa), C. GONZENBACH (*Bol. Inst. Bot., Univ. Cent. Ecuador*, 1 (1942), No. 1, pp. 66-84, figs. 5).—This study of quinoa, a plant of the high Andes of value for food and medicinal purposes, deals with its anatomy and chemical composition, with particular reference to its protein, carbohydrate, and fat contents.

The gaseous exchange of seeds and isolated cotyledons of Cucurbita pepo, R. BROWN (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 22, pp. 293-321, figs. 8).—Using an apparatus (described) in which a single pumpkin cotyledon was cultured and its gaseous exchange measured, it was found that at 18-48 hr. the rates of O_2 uptake and CO_2 production continued to increase and the value of the respiratory quotient to decrease from an initial high value to one of about 0.5. The high value is taken to indicate anaerobic respiration, and the final low values the accumulation of new respiratory carbohydrate. It is suggested that high rates of carbohydrate accumulation and of respiration indicate a high rate of development. Removal of the inner membrane of the seed coat increased both the rates of gas exchange and the value of the quotient. These effects are related to the restricting action of the membrane on O_2 diffusion to the respiring tissues. Raising the temperature occasioned an increase of exchange for both gases, and its mechanism is discussed. Increase in the level of water availability increased the rates of gas exchange and decreased the value of the quotient. It is shown that these effects are due to the influence of this factor on the water content. Light depressed the value of the quotient without any considerable effect on the rate of CO_2 production. This is taken to indicate an effect of light on fat mobilization. It is suggested that in the mass of the cotyledon respiration is partially anaerobic in the early developmental stages. When the embryo is attached to the cotyledon the rates of exchange are higher and the value of the quotient lower than in its absence. This appears to indicate a stimulatory effect of the embryo on cotyledonary development. There are 18 references.

Quantum efficiency of photosynthesis, E. C. C. BALY (*Nature [London]*, 149 (1942), No. 3773, pp. 218-219).—A brief note.

Photosynthesis of algae and other aquatic plants, G. O. BURR. (Univ. Minn.). (In *A Symposium on Hydrobiology*. Madison: Univ. Wis. Press, [1941], pp. 163-181, figs. 14).—Some of the more recent studies in this field are critically reviewed (24 references). Solutes, temperature, light, and CO₂ tension are found to operate simultaneously on the photosynthetic mechanism. In any attempt to describe the environment of aquatics all four should be recorded with the greatest possible precision, and CO₂ tension should be recorded with as great care as O₂ tension and light intensity.

Respiration studies on germinating white-oak acorns, R. E. GIRTON and E. R. PARK. (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 51 (1941), pp. 83-86, figs. 5).—The data presented make it evident that the high moisture content of acorns as compared with many common seeds is related to a high respiratory activity during dormancy. Placed under conditions favorable to germination, white oak acorns may in some cases show increasing O₂ absorption rates from the start. In other cases, apparently associated with higher moisture contents, the initial respiratory rate may fall temporarily, but again rises with time as germination goes on. Increased elongation of the primary root in germination was accompanied by an increased O₂ absorption rate over a considerable period.

Developmental anatomy of the shoot of *Zea mays* L., B. C. SHARMAN (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 22, pp. 245-282, pl. 1, figs. 23).—This detailed account of the development of the corn shoot is examined in relation to the probable movement of nutrients and water in the plant during different growth phases. In the course of the study various points emerged as to development, structure, and morphology, the significance of which is discussed after the observations have been placed on record. There are 29 references.

Nota sobre o sistema radicular da oliveira (Note on the root system of the olive tree), J. V. NATIVIDADE (*Agron. Lusitana*, 3 (1941), No. 1, pp. 15-24, pls. 4; *Eng. abs.*, p. 23).—This note deals with the chief characteristics of the root system observed in trees uprooted by a hurricane, the mechanism of resistance to processes of decay, and the behavior of olives grafted on *Ligustrum vulgare*.

O significado ecológico e fisiológico do sistema radicular aéreo da oliveira (*Olea europaea* L.) e da alfarrobeira (*Ceratonia siliqua* L.) [The ecological and physiological significance of the aerial root system of the olive and carob], J. V. NATIVIDADE (*Agron. Lusitana*, 3 (1941), No. 2, pp. 85-91, pls. 4; *Eng. abs.*, pp. 89-90).—Physiologically, the cordlike growths or ribs on these trees are said to be aerial roots which, after making their way to the ground, aid in supplying nutrients and in consolidating the trunk and fixing it to the ground. The likeness in behavior of these two species, phylogenetically unrelated but both able to avail themselves of such conditions as dry gravelly soils and climates with low rainfall and high atmospheric evaporation, suggests that the formation of aerial roots may be an accommodation to xerophytic habitats whereby, within certain limits, the growth of roots proceeds in the ground independently of the conditions therein. The root-bearing swellings and the aerial roots also serve as true vegetative propagating organs. These trees form the transition between species which bear root initials on the aerial organs but which grow only under certain narrowly limited conditions, and those which bear typical aerial roots.

Methods and instruments for use in measuring tree-rings, H. S. GLADWIN (*Globe, Ariz.: Gila Pueblo*, 1940, pp. [2]+13, pls. 10).—Included in the discussion are collecting specimens of modern and ancient wood, handling cores in

the laboratory, preparation of wood and charcoal specimens, and measuring and photographing tree rings.

Tree-ring analysis: Methods of correlation, H. S. GLADWIN (*Globe, Ariz.: Gila Pueblo, 1940*, pp. [2]+63, [figs. 20]).—This discussion includes existing methods; correlation of tree-ring plots; percentage of agreement; trials and errors; plotting variations of tree rings; station district, province, and plateau composites; variable, double, and missing rings; and tree-growth and cycles.

Parthenocarpy: Natural and artificial, F. G. GUSTAFSON (*Bot. Rev.*, 8 (1942), No. 9, pp. 599-654).—This is a comprehensive review (174 references) with critical discussion of spontaneous and induced parthenocarpy. As to the latter, data are presented on the methods and chemicals used and on plants having produced parthenocarpic fruits with chemical treatment.

[**Botanical studies**], D. M. WELLER (*Hawaii. Sugar Planters' Assoc. Ptd. Rpts.*, 61 (1941), Expt. Sta. Com. Rpt., pp. 42-46).—Brief summaries of progress are included on the effects of colchicine on sugarcane and on the anatomy and histology of the plant including the growing point.

Certain abnormalities in millets induced by X-rays, N. KRISHNASWAMI and G. N. RANGASWAMI AYYANGAR (*Indian Acad. Sci. Proc.*, 16 (1942), No. 1, Sect. B, pp. 1-9, pls. 4).—Some of the recessive abnormalities induced by X-rays in *Eleusine coracana* and *Pennisetum typhoides* are described. There are 20 references.

Dispersion of cellulose strands in cell walls, R. D. PRESTON (*Nature [London]*, 149 (1942), No. 3786, pp. 580-581).—A brief note.

Cytological studies of toxicity in meristem cells of roots of *Zea mays*.—

II, The effects of lithium chloride, J. K. EDWARDS (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 65-67).—Continuing these studies (*E. S. R.*, 77, p. 599), LiCl at 0.01 M concentration proved toxic to meristem cells of corn root tips. The effects of different concentrations on the cytoplasm, nuclear material, and on cell division, with use of acid and basic fixatives, are described.

A staining rack for handling cover-glass preparations, T.-T. CHEN. (Univ. Calif.). (*Stain Technol.*, 17 (1942), No. 3, pp. 129-130, fig. 1).—A porcelain staining rack devised for handling cover-glass preparations is described and illustrated, the design being along the general lines of staining racks for slides commonly sold by commercial houses.

An electric recording marking counter for the consecutive counting of small objects, H. W. WOLF (*Science*, 96 (1942), No. 2496, pp. 409-410, fig. 1).—The new counter devised for counting the projected cross sections of wool fibers, and here described, is said to show possibilities of further applications in science and industry where materials of small surface area are to be counted and identified. With the projection apparatus used much of the eye fatigue associated with technics involving direct scrutiny of minute objects through a microscope is eliminated. Utilization of this electric counter has greatly speeded up wool fiber analysis.

GENETICS

A new tetraploid wheatgrass from Nevada, J. H. ROBERTSON and L. WEAVER. (U. S. D. A. et al.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 6, pp. 434-437, figs. 2).—Data on a group of extremely large plants of *Agropyron spicatum* are presented. Considering the lack of definite evidence for hybridization as compared with the occurrence of distinctly tetraploid morphological characters and the double number of chromosomes, it is believed most likely that these plants are a tetraploid form of the species.

Self-incompatibility in polyploid forms of *Brassica* and *Raphanus*, H. W. HOWARD (*Nature [London]*, 149 (1942), No. 3776, pp. 302-303).—In *B. rapa*, *B.*

campestris, and *R. sativus* the autotetraploid and the diploid branches of colchicine-produced diploid-tetraploid sectorial chimeras obtained by the author are both reported always to have been self-incompatible.

Cytogenetical studies in *Nicotiana*.—II, Morphological features of *Nicotiana glutinosa* and the hybrid between *Nicotiana glutinosa* and *N. tabacum*, T. S. RAGHAVAN and A. R. SRINIVASAN (*Indian Acad. Sci. Proc.*, 14 (1941), No. 1, Sect. B, pp. 35–46, pl. 1, figs. 43).—Continuing the series,⁴ the microsporangial development in *N. glutinosa* is described, the results of a comparative study of the embryo sac and embryo formation in this species and in *N. tabacum*, the two parents of the hybrid, are presented, and the development and behavior of the megaspore in the hybrid is described and compared with that of the parents. There are 24 references.

Mutation of *Phytomonas stewartii* by X-ray irradiation, R. E. LINCOLN and J. W. GOWEN. (Iowa Expt. Sta.). (*Genetics*, 27 (1942), No. 4, pp. 441–462, pls. 2).—Under X-irradiation at an intensity such that 100,000,000 viable cells suspended in broth were reduced to about 1,000 in 25 min., survival followed the simple exponential function—survival ratio = e^{-ar} , where a is a constant and r is the roentgens to which the bacteria are exposed. Mutations were observed in colony color, surface appearance, and size. The only difference observed between spontaneous mutations and those induced by irradiation was the increased frequency of the latter. The mutation pattern observed in two widely different stocks of *P. stewartii* was similar. Mutations in colony characters may be accompanied either by increased or decreased virulence for corn. Except for mutations to an unstable form, mutants appeared to be as stable as the parent strains. From the evidence presented it would appear that the terms “mutant,” “variant,” “saltant,” and “dissociant” as applied to bacteria are synonymous and are applied to phenomena resulting from gene mutation. From this standpoint the physical basis of inheritance in *P. stewartii* is similar to that of higher organisms. There are 15 references.

The inheritance of wavy-leaf character in the peach, D. H. SCOTT and F. P. CULLINAN. (U. S. D. A.). (*Jour. Hered.*, 33 (1942), No. 8, pp. 293–295, figs. 2).—An unusual foliar character of deeply serrated, very wavy leaves, observed in a selfed progeny of the Gold Drop peach, was found to be controlled by a single pair of alleles, with the wavy character recessive to the normal smooth leaf. The wavy leaf condition is undesirable because plants possessing it tend to grow weakly, with a dwarf habit, and set fruit poorly.

[Experiments in reproduction of animals and crossing swine by the Ohio Station] (*Ohio Sta. Bul.* 617 (1940), pp. 49–50, 70).—Results are briefly reported on damage to reproduction in farm animals of vitamin A deficiencies; and crossing three breeds of pigs—Poland China, Hampshire, and Duroc-Jersey.

Hybrid vigour in sheep as indicated by physiological characters, A. S. KARPOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 7, pp. 719–721).—Comparisons of measurements and physiological characters of 20–30 purebred Romney and Tsigai ewes over 2.5 yr. of age with crossbreds between them showed that the crosses had richer blood values than the parent breeds. Differences in body size and body weight were insignificant. The breed differences in blood factors were related to growth, development, constitution, and production of the breeds. The higher blood value of the crosses is regarded as one of the physiological causes of hybrid vigor.

Litter size and weight as permanent characteristics of sows, J. L. LUSH and A. E. MOLLN. (Coop. 13 expt. stas.). (*U. S. Dept. Agr., Tech. Bul.* 836 (1942), pp. 40, figs. 4).—A statistical analysis based on variance methods is reported for the numbers of pigs farrowed in 7,415 litters, number weaned in 4,920

⁴ *Jour. Indian Bot. Soc.*, 20 (1941), No. 5–6, pp. 307–340, pl. 1, figs. 82.

litters, and the weaning weights of 2,144 litters of Poland China, Duroc-Jersey, Chester White, Hampshire, Yorkshire, Berkshire, Tamworth, and Danish Landrace breeds born at eight experiment stations and the Department in conjunction with the Regional Swine Breeding Laboratory projects. Litters were tabulated with reference to the age of the sows at 6-mo. intervals with correction for litter size. It was found that additions of 1 pig to litters born to sows at 1-1.5 yr. of age removed most of the variance resulting from dams' age. Litter sizes increased for sows up to 3.5 yr., but after this period there were declines. The age of the sows had much less effect on the number and weights of pigs weaned than on the number farrowed, and no whole number corrections seemed needed. Variance between litters of the same sows was caused by general environmental changes from one farrowing season to another as indicated by a symmetrical block analysis. Such a method does not lend to determination of the effects of breed differences. In considering further plans for higher productivity, it is pointed out that sows' future abilities will be only about one-sixth as far above the average of the herd as past records were found when selection was based on a single litter. Selection should be based on as many litters as possible produced by the sow. Selection will be 31 percent more effective on 2 than 1, and 50 percent more progress will be made on 3 than on a 1 litter basis. Selection based on production of close relatives may help, but the individual should receive at least three times as much consideration as the characteristics of the dam or each full sister. Pertinent and related literature is discussed.

Colour-variation in Wessex Saddleback pigs and its relation to the conformation and the economic usefulness of the breed, T. M. OLBRYCHT (*Natl. Pig Breeders' Assoc. Bul. 2* (1941), pp. 34, figs. 6).—Both hereditary and non-hereditary variations in the color and shape of the saddle of Wessex Saddleback pigs were observed in a study of 2,318 individuals from the record books of the breed born in 1937, 1938, and 1939. The width of the belt near the right shoulder of 328 registered pigs ranged from 0.1 to 16, averaging 6.1 in. Simple segregations were not found in the shape and size of the saddle, and therefore multiple factors and nonhereditary conditions were considered responsible. The main factor *W*, for white belting, was dominant. There were plus and minus modifiers. The extreme effect of the modifiers was respectively to produce all black and all white individuals. The so-called ginger color was recessive. The gene *A*, for white color, was dominant in the hair and recessive in the skin. In crosses of large white boars with Wessex Saddleback sows, there were produced 751 all white among 770 *F*₁ pigs. Some of those that were white had irregular black spots in the skin, giving a bluish appearance. The relation of the genotype to economic superiority is discussed.

The anomaly of a normal Duke's and a very prolonged saline bleeding time in swine suffering from an inherited bleeding disease, E. T. MERTZ (*Mo. Expt. Sta.*). (*Amer. Jour. Physiol.*, 136 (1942), No. 3, pp. 360-362, fig. 1).—In affected animals (*E. S. R.*, 87, p. 361) the saline bleeding time was several times that of normal nonbleeding swine. This test served to distinguish bleeders from normals.

Chromosomes of the red fox, L. WIPF and R. M. SHACKELFORD. (*Univ. Wis.*). (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 7, pp. 265-268, figs. 5).—The chromosomes in red, black, and platinum-silver foxes from testes appeared similar in size, shape, and other morphological characteristics, but varied in length. The number was 17 in the haploid and 34 in the diploid. One pair of satellite chromosomes was found. Reference is made to the lethal condition of the platinum-silver character in foxes.

Studies on an anophthalmic strain of mice.—III, Results of crosses with

other strains, H. B. CHASE. (Univ. Ill.). (*Genetics*, 27 (1942), No. 3, pp. 339-348).—Continuing this series (E. S. R., 86, p. 461), the gene *cy* is suggested as the recessive factor causing the eyeless condition in the strain of mice producing 91 percent eyeless and 9 percent having an intermediate eye condition on one or the other side of 1,054 individuals produced in 17 generations of brother-sister matings. Crosses with four lines which at least produced some eyeless individuals gave only normals in the F_1 . All possible variations and asymmetry occurred in the F_2 , F_3 , and backcross generations. The left eye tended to be more normal than the right eye, and the eyes of δ s were nearer normal than those of ♀ s. Modifiers lowered the expected percentage of normals. The second backcross generations from eyeless segregants mated back to the original eyeless parent produced 100 percent eyeless young or at least young with very small eyes. A considerable amount of nonhereditary variation seemed to exist.

The crossbreeding of poultry, D. C. WARREN (*Kansas Sta. Tech. Bul.* 52 (1942), pp. 44).—Comparison of the morphological characteristics, egg production, and viability of reciprocal crossbred birds with purebreds of the Single-Comb White Leghorn, Single-Comb Rhode Island Red, Barred and White Plymouth Rock, White Wyandotte, New Hampshire, Australorp, Black and White Minorca, Ancona, Light Brahma, and Jersey Black Giant breeds showed that cross-breeding seemed to stimulate the vigor of the progeny. A chart based on the 14,566 purebred and crossbred chicks showed cross-breeding tended to improve the hatchability of the eggs, viability of the chicks, rate of egg production, and growth. Greater variation existed in crosses of strains within the same breeds. There was a reflection in the offspring of the quality of the purebreds used to produce the crossbreds. The extensive use of cross-breeding for broiler production is noted, as well as attention to chick and adult mortality, growth rate to 8 weeks of age, egg production, broodiness, egg color, and dressing percentage.

The relative effect of environment and heredity upon body measurements and production characteristics in poultry.—II, Period of egg production, H. S. GUTTERIDGE and J. B. O'NEIL (*Sci. Agr.*, 22 (1942), No. 8, pp. 482-491, figs. 6).—Through an interchange of three strains of pullets between three locations climatologically different, environment was found by variance analysis to be a much greater factor influencing egg production than heredity, thus confirming the studies on growth previously noted (E. S. R., 88, p. 37). Both environment and heredity were shown to enter into body weights and egg weights with nearly equal importance.

Growth and development, with special reference to domestic animals, LIV, LV (*Missouri Sta. Res. Buls.* 349 (1942), pp. 11, figs. 7; 350, pp. 14, figs. 5).—This series (E. S. R., 87, p. 265) is continued.

LIV. Age changes in size, energy metabolism and cardio-respiratory activities of thyroidectomized cattle, S. Brody and R. F. Frankenbach.—Thyroidectomy of a Jersey heifer at 54 days of age was found to reduce mature body weight by over 50 percent and heat production per unit surface area about 40 percent, as contrasted with a normal control heifer. Both respiration volume and frequency were less than normal in the thyroidectomized animal. The metabolic rate was increased to normal or better within a week by feeding an iodized milk protein (thyrolactin). After several months' feeding the hair coat was no longer rough, and heat was experienced with the development of the mammary gland and the horns.

LV. Resting energy metabolism and ventilation rate in relation to body weight in growing Holstein cattle, S. Brody, H. H. Kibler, and A. C. Ragsdale.—The resting heat production per square meter of body surface area for 15 Holstein heifers at monthly intervals from birth to 24 mo. of age was plotted by month against age and body weight. After 6 mo. the exponent b in the equation $Y = aX^b$

was about 0.6 for this breed as with Jerseys (E. S. R., 87, p. 265). Increasing body weight about 1 percent increased maintenance about 0.6 percent. Resting maintenance per square meter of body surface was about 2,140 Calories in Holsteins, as contrasted with 2,000 Calories in Jerseys. The value of *b* for ventilation rate was 0.77. Increasing body weight 1 percent tended to increase ventilation rate about 0.77 percent.

The influence of estradiol on the secretion of gonadotropic hormone in adult parabiotic rats, R. K. MEYER and C. BIDDULPH. (Univ. Wis.). (*Amer. Jour. Physiol.*, 134 (1941), No. 1, pp. 141-146, fig. 1).—In 14 parts of ♀ rats united parabiotically continuous vaginal oestrous was induced, an average of 39 days following ovariectomy of the other partner. The oestrous cycles of the normal ♀s persisted as long as the ovariectomized rat was injected with oestradiol. Hypophysectomy of ovariectomized partners and pairs in continuous oestrus caused replacement of the continuous oestrus of the normal partner by continuous dioestrus. Oestrogen seems to prevent hypersecretion of the gonadotropic hormone of the pituitary gland of the adult ovariectomized rat.

Androgen production during pregnancy and lactation in the rat, M. W. BURRILL and R. R. GREENE (*Anat. Rec.*, 83 (1942), No. 2, pp. 209-227, pls. 2, fig. 1).—A series of 116 ventral prostates from ♀ white rats representing each day of pregnancy and lactation showed evidence that during days 1-5 some ♀s produced a physiological effective quantity of androgen. The prostates showed no evidence of androgen in the period 6-10 days of pregnancy. There was an increase of androgen production during the last 4 days of gestation, and the prostates continued to show an effective dose during the first 15 days of lactation. The source of the androgen was not ascertained.

Pituitary weight of growing male albino rat related to body weight, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 31 (1942), No. 2, pp. 261-263, fig. 1).—A correlation of 0.92 ± 0.01 was found between the pituitary weights and body weights in 135 ♂ albino rats weighing 60-383 gm. Correlation was also shown by regression equations, all of which emphasized the desirability of varying the size of pituitary hormone injections with the weight of the test animal for assay purposes.

Relation of thyroid to growth.—I, Effects of crystalline thyroxin upon rate of growth, food intake, and body composition of female albino mice, M. KOGER, V. HURST, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 31 (1942), No. 2, pp. 237-244, fig. 1).—Doses of 0.007-0.04 mg. of thyroxin per day or double the amount on alternate days were administered subcutaneously to groups of 10-12 10-15 gm. virgin mice for 5 weeks. The thyroxin-injected animals consistently and repeatedly made about 28 percent greater gains and consumed 25 percent more feed than controls during the 5-week period. Thyroxin-treated mice stored more nitrogen and gained more than controls per unit of food intake. After the first few weeks of rapid gains the controls made more efficient feed utilization than the thyroxin-injected animals.

Mammary growth in male mice fed desiccated thyroid, W. U. GARDNER (*Endocrinology*, 31 (1942), No. 1, pp. 124-127).—All except 1 of 14 intact ♂ mice fed 1.5 gm. of desiccated thyroid per kilogram of ration showed proliferation of the mammary duct system not apparent without the thyroid treatment. During the seventeenth to forty-seventh day the thyroid-fed animals consumed greater amounts of feed, but the gains made were equal to those of mice on normal diets.

Some effects of thyroid and gonadotrophic preparations in the fowl, A. W. GREENWOOD and J. S. S. BLYTH (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci.*, 31 (1942), No. 3, pp. 175-185).—Anterior pituitary extracts and allied

preparations, together with powdered thyroid, were administered to Brown Leghorn hens 2-4 yr. of age at about the molting period. Studies were made of egg laying and the changes in the comb size. The hormones were administered subcutaneously, implanted, or given in pressure tablets, and the thyroid was fed in gelatin capsules or pills. Sheep, horse, and pig pituitary extracts and pregnancy urine were mainly ineffective. Pregnant mare serum, however, caused cessation of egg production and moult in the laying hens in 5 days with an increase in the size of the combs. In nonlaying hens there was little effect. Ovarian stimulation seemed to result from thyroid feeding and some resumed egg production. Most of the hormones were administered to groups of about 15 hens.

Pairing responses of free-living valley quail to sex-hormone pellet implants, J. T. EMLEN, Jr., and F. W. LORENZ. (Univ. Calif.). (*Auk*, 59 (1942), No. 3, pp. 369-378).—In two experiments four ♂ and seven ♀ quail were implanted subcutaneously with testosterone or stilboestrol pellets during the nonbreeding season and the effects on sexual behavior noted. The ♂s treated with testosterone became pugnacious and mated, but stilboestrol produced no measurable behavior responses.

Action of diethylstilbestrol in the chick, W. R. BRENEMAN (*Endocrinology*, 31 (1942), No. 2, pp. 179-186).—Continuing studies of the effects of ♀ hormones and limitations of rations on body, gland, and comb growth of chicks (E. S. R., 87, p. 502), the administration of diethylstilboestrol to cockerels had a marked inhibiting effect on comb and gonad development, similar to oestrogen. These studies were conducted with groups of about 15 cockerels, pullets, or capons on adequate and limited diets.

Fertility in the male domestic fowl, J. E. PARKER, F. F. MCKENZIE, and H. L. KEMPSTER. (Coop. U. S. D. A.). (*Missouri Sta. Res. Bul.* 347 (1942), pp. 50, figs. 21).—The gross anatomy of the reproductive tract of ♂ fowls is described, and the ratio of testis weight to body weight is noted. The volume of semen from 14 New Hampshire ♂s collected in the avian semen collector (E. S. R., 82, p. 324) varied from 0.05 to 1 cc. in 177 ejaculates made under observation in 15-min. mating trials. Such ♂s were allowed access to from 12 to 18 ♀s once each month, some being kept with the ♀s and others in individual breeding cages. Semen collections by the abdominal massage technic of Burrows and Quinn (E. S. R., 77, p. 180) from 13 New Hampshire ♂s kept in batteries ranged from 0.27 to 1.5 cc. Much variation existed in the number of sperm produced, but there was a tendency for some birds to produce consistently large numbers. Sexual activity and sperm production were greatest by those birds that were kept continuously in breeding pens. In general fowl semen was alkaline in reaction, ranging from pH 7.15 to pH 7.64 for high percentages of fertility. The mean volume, sperm concentration, and number of sperm decreased in succeeding ejaculates and the alkalinity increased. Seasonal variations in semen production were noted. Sexual activity was depressed during January, June, July, and September. Especially in the last month there was heavy molting, and such birds objected to being handled. By artificial insemination of New Hampshire hens fertilization with semen from Barred Plymouth Rock, White Leghorn, and New Hampshire ♂s gave about equal results. From mixed samples it was observed that about equal numbers of chicks were sired by the New Hampshire and Barred Plymouth Rock cockerels, but fewer were sired by White Leghorn ♂s. No fertile eggs were laid by hens on the next day after insemination. The highest percentage of fertile eggs was reached on the third, and the last fertile egg was laid on the twenty-fifth day after insemination.

On the development of feathers, F. R. LILLIE (*Biol. Rev.*, 17 (1942), No. 3, pp. 247-266, figs. 5).—The morphology and histology of feather development are

reviewed, including the effects of host and genotype of the transplants and the influence of hormones.

A defect in the coagulation mechanism of swine blood, M. E. MUHRER, A. G. HOGAN, and R. BOGART. (Univ. Mo.). (*Amer. Jour. Physiol.*, 136 (1942), No. 3, pp. 355-359).—The hemophilialike condition previously described in swine (E. S. R., 87, p. 361) was especially studied, and a diagnostic test was developed based on fibrin precipitation time of diluted plasma. The usual practices of ringing and castration were frequently fatal in this strain. The coagulation time of valuable experimental animals was reduced by injection of the blood globulin fraction as in hemophilia.

Results of the haematological study of the hogs at the all-union agricultural exhibition, H. F. KUSHNER and II. B. ALPEROVICH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 31 (1941), No. 7, pp. 722-724).—Study of the blood picture of boars and sows of the Large White (English) breed above 2 yr. of age showed the hemoglobin content and number of erythrocytes to be greater in boars than in sows. After 2 yr. of age the changes with age were insignificant. Differences between the breeds based on 14 Large White (English), 4 White Ukrainian, 5 Breit, and 4 Livny sows were not consequential. These data on swine supplemented the blood values of horses, cattle, and sheep previously noted (E. S. R., 86, pp. 313, 610, 611).

A preliminary note on the temperature of the scrotal skin of the bull and its relation to air, skin, and body temperature, J. QUINLAN and G. RIEMER SCHMID (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 299-312, figs. 5).—Measurements of the scrotal temperature of a Sussex bull showed direct correlation with skin temperatures, but no correlation was found between scrotal temperature and exposure to sunrays and air temperature.

Studies of the metabolism of bovine epididymal spermatozoa, G. HENLE and C. A. ZITTLE (*Amer. Jour. Physiol.*, 136 (1942), No. 1, pp. 70-78, figs. 3).—Appreciable differences in respiration were found in sperm suspensions from individual bovine epididymis due to individual sample differences in concentration of sperm and pH, as well as the place in the testes from which the sperm were removed. Optimum respiration occurred in semen containing 400-800 million cells per cubic centimeter and at a pH of 7.5-8. Seminal spermatozoa showed a slower respiration rate than epididymal sperm. The drop in respiration encountered in concentrated suspensions was ascribed to insufficient diffusion of oxygen into the medium. Seminal fluid did not influence respiration rate.

Experiments concerning supposed influence of cock's head appendages on size of testes, W. LANDAUER. ([Conn.] *Storrs Expt. Sta.*). (*Endocrinology*, 31 (1942), No. 1, pp. 78-83).—Removal from cockerels of the comb and wattles, in part or in entirety, was followed by increased testicular weights 7 mo. later. There was no evidence for a specific effect of comb or wattles on the testes size, but the enlargement reported by Buckner et al (E. S. R., 71, p. 365) and others seemed to be due to the trauma. In the conduct of this study there were employed 7 groups of 44-53 chicks operated at 46 days of age.

Sex inversion in the peafowl, T. H. MORGAN (*Jour. Hered.*, 33 (1942), No. 7, pp. 247-248, figs. 2).—Account is given of a peahen which changed partially from the usual drab plumage and egg laying of the ♀ to the characteristics and more vivid plumage of the ♂.

Bionomic studies on cattle in the semi-arid regions of the Union of South Africa.—IV, The ovarian cycle of heifers during summer, J. QUINLAN, J. H. R. BISSCHOP, and T. F. ADELAAB (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 213-241, figs. 16).—The duration of oestrus in heifers of the Afrikaner, Fries, Red-Poll, and Sussex breeds was determined

with aproned and teaser bulls at hourly intervals as 7.88, 11.67, 14.0, and 9.0 hr., respectively. Of those tested 94 percent permitted service for less than 18 hr. Variations in the sexual activity of the heifers during oestrus is described. Heifers receiving bonemeal were sexually more active than heifers which received no phosphate supplement.

Studies on the nature of the onset of oestrus in ewes following a period of sexual inactivity, J. QUINLAN, H. P. STEYN, and D. DE VOS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 243-262, figs. 2).—The average duration of 65 oestrous periods in ewes, ascertained by willingness to mate with rams, was 8.2 hr., with the dioestrous period averaging 15.8 days. Irregularities in oestrus were noted. Weak oestrous periods were irregularly followed by ovulation. Seasonal conditions other than nutrition seemed responsible for the low genital activity in October and November. The study was based on observations of 99 Merino ewes at 3-hr. intervals from November 20 to December 20, 1939. The post mortem characteristics of the genitalia and oestrous conditions of 16 ewes slaughtered are given.

The thecal gland in the guinea pig ovary, W. T. STAFFORD, R. F. COLLINS, and H. W. MOSSMAN. (Univ. Wis.). (*Anat. Rec.*, 83 (1942), No. 2, pp. 193-207, pls. 2).—Changes in the thecal gland tissue of the guinea pig ovary were observed at, near, and during the oestral period in 19 individuals, which suggests that the gland is probably the most likely source of oestrogenic hormone. In the atretic follicles the theca interna never assumes the typical gland structure.

Survival of spermatozoa in the female reproductive tract of the bat, W. A. WIMSATT. (Cornell Univ.). (*Anat. Rec.*, 83 (1942), No. 2, pp. 299-307, pl. 1).—Even though isolated in November the presence of motile sperm in the uteri was shown on autopsy as much as 5 mo. later in *Myotis l. lucifugus*. Development was evidently initiated in ova by sperm of *Eptesicus f. fuscus* that had survived the winter period.

Normal and experimental mammary involution in the mouse as related to the inception and cessation of lactation, W. L. WILLIAMS (*Amer. Jour. Anat.*, 71 (1942), No. 1, pp. 1-41, pls. 5).—Histological study of involution of the mammary gland with and without suckling, hypophysectomy, and the administration of hormones to 116 ♀s showed that in the complete absence of suckling involution was rapid and secretion ceased within 24 hr. postpartum and the gland became atrophic. Suckling influenced excretion from the alveolar cells, and when young were removed on the tenth day of lactation did not induce as sudden cessation of lactation as when the young were removed on the fourth day. Rapid involution followed normal removal of the young on the twenty-first day of lactation. These results largely agree with the findings of Turner and Gomez (*E. S. R.*, 69, p. 349). Hypophysectomy accelerated involution of the mammary gland.

Observations on artificial insemination of sheep with fresh and stored semen, J. QUINLAN, H. P. STEYN, and D. DE VOS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1-2, pp. 263-297, figs. 7).—The artificial insemination of Merino ewes with semen stored up to 12 hr. gave satisfactory results. Storage of semen for longer periods decreased in success, and no pregnancies occurred with storage periods longer than 72 hr. In the conduct of the work 196 Merino ewes were artificially inseminated with semen diluted by methods suggested by Winters et al. (*E. S. R.*, 80, p. 330) and stored for 6, 12, 18, 24, 48, 72, and 96 hr. and for longer periods. These results were compared with those of 18 normally mated ewes. In field observations 680 Karakul ewes were inseminated with semen from 1 ram. Of those which suckled lambs 66.2 percent became pregnant, but only 25.8 percent of the ewes not suckling lambs were settled.

Distinguishing sex of chicks at hatching, D. C. WARREN (*Kansas Sta. Bul.* 307 (1942), pp. 29, figs. 13).—The general principles of sexing chicks at hatching, based on the behavior of sex-linked characters in breed crosses, especially gold × silver, barred × nonbarred, and rate of feathering crosses are reviewed. The autosexing breeds and the vent method of sexing are noted as other methods which have proven applicable and useful.

FIELD CROPS

[Research with field crops by the Georgia Coastal Plain Station, 1940]. (Partly coop. U. S. D. A., Ga. Expt. Sta., Univ. Ga., et al.). (*Georgia Coastal Plain Sta. Bul.* 32 (1941), pp. 15-43, 72-77, 113-121, 128-133, figs. 5).—Field crops experiments reported on (*E. S. R.*, 86, p. 179) for 1940 and for different periods of years included variety tests with cotton, corn and hybrids for yield and resistance to weevils, oats, wheat, rye, grain sorghum, sorgo, peanuts, sweetpotatoes, soybeans for seed and forage, cowpeas, velvetbeans, crotalaria, winter cover crops, pasture grasses, and miscellaneous summer forage crops; a production test with Alyceclover; breeding work with corn, cotton, oats, peanuts, and pasture grasses; winter cover and green manure crops for cotton and corn; control of peanut leaf spot; cultural (including planting) experiments with corn, oats, wheat, peanuts, tobacco, and winter cover crops; and development of sea-island cotton production. Fertilizer experiments included formulas and carriers of N, P, and K with cotton and sweetpotatoes, and also fertilizer placement for cotton and tobacco; N and K top dressings for cotton and sweetpotatoes; secondary nutrient elements for cotton, sweetpotatoes, and tobacco; K and S relation, Ca and Mg, plant bed fertilizer, and acid, basic, and neutral fertilizer tests with tobacco; tobacco rotations; ratios of organic:nonorganic N with sweetpotatoes; and experiments with corn, oats, and peanuts, mainly formulas and rates of application. Recommendations on soils, varieties, seedbeds, fertilizers, spacing and topping, and curing for flue-cured tobacco are again included. In addition to the above work with flue-cured tobacco, reports are also made on the progress of studies with cigar wrapper tobacco at the Shade Tobacco Substation near Attapulugus, comprising fertilizer formulas, with variations in N, P, K, Ca, Mg, S, B, and Cl, varying ratios of nutrients and of N carriers, rates of stable manure, and organic N and P carriers; fertilizer placement; plant bed fertilizers; and seed production.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.],* 5 (1942), No. 10, pp. 1, 2, 3-4, 5, 6, 7, 8, fig. 1).—Experiments with field crops and related agronomic research are reported in articles entitled October Best for Planting Small Grains, by J. F. O'Kelly (pp. 1, 7, 8); Fall Seedings Begin Year-Round Program for Establishment of Permanent Pastures, by H. W. Bennett (pp. 1, 2); Delayed Harvest of Starch Potatoes Found Practical, by J. M. Lutz and W. S. Anderson (p. 2) (coop. U. S. D. A.); Care in Handling, Storage, Needed to Keep Sweetpotato, by E. A. Currey (p. 7); Phosphorus and Lime Most Profitable Fertilizers for Producing Hairy Vetch, by J. L. Anthony and J. Pitner (p. 7); Inoculation Aids Necessary Growth of Winter Legumes, by W. B. Andrews (p. 8); and Fertilization, Early Seeding, Drainage Important in Growth of Winter Legumes, by C. D. Hoover (p. 8). Brief reports are also made by C. Dorman on agronomic work at substations, including variety tests with cotton, corn and hybrids, oats, wheat, barley, sugarcane (coop. U. S. D. A.), potatoes, soybeans and edible soybeans, cowpeas, and clovers; breeding work and strength tests with cotton; a comparison of Alyceclover and Kobe lespedeza as maintenance feed for beef cattle; cultural tests with corn and oats; fertilizer experiments with cotton, corn, hairy vetch, pastures,

and summer and winter legumes; growing seed of bur-clover and crimson clover; other pasture studies; yields of cotton after various green manures and sorghums v. commercial N; soil improvement crops for corn and cotton; interplanting of corn with legumes; and crop rotations.

[**Agronomic investigations in Ohio**]. (Partly coop. U. S. D. A.). (*Ohio Sta. Bul.* 617 (1940), pp. 7-9, 10-12, 13-15, 39-40, 69, 71, 72, figs. 5).—Brief reports are made on experimentation (E. S. R., 83, p. 480) concerned with progress of the corn breeding program resulting in 40 new hybrids ready for farm trial; wheat root strength as a guide to winter hardiness; limiting of sugar beet yields due to lack of air in soils; potato yields in response to right fertilizers; relation of fertilization and quality of potatoes; increase of potato yields by manure and fertilizer; tests of earlier soybean varieties; production of high tobacco yields in manured and fertilized rotations at the Southwestern Experiment Farm; superiority of timothy meadows on fertile soil at the Washington County Experiment Farm; effects of day length on bluegrass; improvement of grass growth by walnut and locust trees; need of sweetclover rotations for plenty of K; value of white clover in increasing N in pasture herbage and merits of different white clover strains for pastures; development of all-season pasture systems; eradication of field bindweed with sodium chlorate; and killing weed seed in soil with chloropicrin (tear gas).

[**Agronomic studies in Rhode Island**]. (Partly coop. U. S. D. A. et al.). (*Rhode Island Sta. Rpt.* [1941], pp. 10-17, 23-26, 27-30, 47).—Reports of progress are made (E. S. R., 85, p. 753) from variety tests with corn (and hybrids), potatoes, and lawn and turf grasses; fertilizer experiments with potatoes, mangels, onions, carrots, parsnips, alfalfa, clovers, and lawn and turf grasses, particularly varieties and strains of bents; planting, spraying, fertilizer, and pH range tests with potatoes; residual effects from different levels of fertilizer, as shown by yields of corn; effects of crops on succeeding crops; B deficiency in rutabagas and mangels; crop rotations; seasonal development of roots of Colonial bent; breeding work with bentgrasses for pasture; chemical weed control tests on closely cut turf and on fairways; endurance of grasses and grass mixtures on athletic fields and airports; seed production of bentgrass varieties and strains, especially in response to fertilizer treatments; comparisons of Sudan grass, millet, oats, and winter rye and wheat planted at various dates for supplementary pasture; and merits of different forages and mixtures for grass silage.

An appraisal of range survey methods from the standpoint of effective range management, E. H. REID, G. D. PICKFORD, and N. T. NELSON (*U. S. Dept. Agr., Forest Serv., Pacific Northwest Forest and Range Expt. Sta., Range Res. Rpt.* 2 (1942), pp. [1]+V+66, pls. 3, figs. 21).—A field test comparing accuracy and costs of the two standard methods of estimating vegetation density and of the grid and aerial photograph range type mapping procedures was made in 1939 to determine which combinations of methods best fulfill requirements of a good range survey method in dependability of forage estimates, reliability of forage type maps, and cost.

The type-sampling reconnaissance and type-sampling square-foot-density methods and the grid reconnaissance method, conducted as in the study, appeared justifiable for use in range surveys from the viewpoint of uniformly dependable forage estimates. The type-sampling reconnaissance method is the cheapest and gives most dependable results of the standard range survey methods if films of aerial photographs and the completed planimetric base map are available without cost, but where these conditions do not prevail the grid reconnaissance method conducted at an intensity of two strips per section is recommended on ranges with gentle topography. If, for reasons aside from obtaining dependable esti-

mates of amount and distribution of range forage, sampling characteristics of the type-sampling square-foot-density method are preferred to those of the type-sampling reconnaissance method its use in range surveys is held justifiable.

Field work with the reconnaissance method cost 9.00 mills per acre when mapping directly on aerial photographs and 9.09 mills when mapping with the grid procedure, with the square-foot-density method 11.53 mills per acre when mapping with type-sampling procedure and 9.88 mills per acre when mapping with grid procedure. Aerial photography and drafting the planimetric base map increased the survey costs about \$5.11 per square mile or 7.98 mills per acre.

Important plants on national forest ranges of eastern Oregon and eastern Washington, E. H. REID (*U. S. Dept. Agr., Forest Serv., Pacific Northwest Forest and Range Expt. Sta., Range Res. Rpt. 1 (1942), pp. [1]+64, figs. 91*).—Simple keys, descriptions, and notes are given on the occurrence and forage value of important plants on the national forest ranges of eastern Oregon and eastern Washington. Supplementing the Range Plant Handbook (E. S. R., 77, p. 756), it includes only species that are important forage plants or that are unimportant as forage but are abundant on the range.

Guides to determine range condition and proper use of mountain meadows in eastern Oregon, G. D. PICKFORD and E. H. REID (*U. S. Dept. Agr., Forest Serv., Pacific Northwest Forest and Range Expt. Sta., Range Res. Rpt. 3 (1942), pp. [22], figs. 6*).—Stressing the importance of mountain meadows to summer range forage production in eastern Oregon, this progress report gives general guides by which to judge the condition and the proper use of mountain meadow vegetation.

The effect of different phosphatic fertilizers on the yield, plant population, and chemical composition of pasture herbage on Dunmore and Emory soils, R. E. O'BRIEN and S. S. OBENSHAIN (*Virginia Sta. Tech. Bul. 80 (1942), pp. 37, figs. 7*).—The relative efficiency of several P fertilizers in increasing yields and improving the N and mineral contents of old pasture sods was determined, 1934–40, at Blacksburg and at Glade Spring, both in the limestone valley region of southwest Virginia. During the first 3 yr. P fertilizers only were broadcast on the surface annually in early spring at the acre rate of 50 lb. of P_2O_5 . In following years 300 lb. of an 8–16–16 fertilizer were applied. One-half of each plat received ground limestone 1 ton per acre every 4 yr.

Herbage yields at Blacksburg rose steadily each year (except for the dry 1936 season) from 1934 to a peak in 1938, then decreased sharply in 1939 due to drought. The sod also steadily improved during the first 5 yr. The peak in both yield and plant population was reached in 1938, and thereafter where plant food was adequate, both depended largely on proper seasonal distribution of rainfall. The more readily available sources of P produced a marked increase in the average yield of herbage at Blacksburg. On limed plats dicalcium phosphate produced the highest average annual yield (air-dry) 4,307 lb., and the limed check 2,759 lb.; on unlimed plats superphosphate produced 4,477 lb., dicalcium phosphate 4,436 lb., and the unlimed check 2,940 lb. Liming resulted in a slight reduction in yield in every case. The relative efficiency of the carriers on a P equivalent basis with and without lime was in the descending order dicalcium phosphate, superphosphate, and triple, basic slag, tricalcium, and raw rock phosphates. Each P fertilizer used increased the weighted average percentage of N, P, and Ca in herbage, but with limed raw rock phosphate the increase was negligible, while several treatments gave very small increases in Ca. Limed and unlimed triple, dicalcium, and superphosphate treatments increased the average P content of herbage by 150 percent over the respective checks. Liming had no appreciable effect on average percentages of the constituents in herbage except with raw rock phosphate. The average annual uptake of P about equaled the amount (48

lb.) applied in the fertilizer where the more readily available P carriers were used, while on check plats it was only about 20 lb. All P treatments gave decidedly higher annual uptakes of N and Ca than the checks.

On fertile Emory silt loam at Glade Spring where the unlimed check averaged 6,263 lb. of air-dry herbage per acre, there was slight response to P and none to liming, but there was marked response to most P fertilizers on the less fertile Dunmore silt loam. Although P fertilizers had little effect on the N and Ca contents of herbage, certain materials appreciably increased the P contents. On Emory soil only triple, dicalcium, and superphosphate treatments gave appreciable increases, but on Dunmore soil all phosphates, except limed raw rock phosphate, produced rather marked increases in the P content of herbage. The annual utilization of P by herbage on Emory soil usually equaled or exceeded that applied annually. With an uptake of about 40 lb. of phosphoric acid on the no-P plats, recovery of applied P was in all cases less than 100 percent. On Dunmore soil where the percentage composition of the herbage was lower and the yields were much lower, the annual utilization of P was only about one-half of the P applied.

Red kidney beans in California, F. L. SMITH (*California Sta. Bul.* 669 (1942), pp. 21, figs. 4).—Red kidney bean production in California is discussed, with special emphasis on improvement of types, particularly Red or Western Red Kidney. The State grows only about 12 percent of the national total for this variety, but furnishes seed for New York, which produces the most Red Kidney beans. Production in California is limited largely to river-bottom soils of the Sacramento and San Joaquin Valleys. Cultural and harvesting methods common in the growing of the crop are described, with emphasis upon seed injury during threshing and recleaning and upon its importance in seed production. Diseases and insect pests and their control are discussed briefly. Details are given on the pedigree, yield, and rise to dominance in California of Red Kidney 7811, a superior strain isolated by the station.

Growing velvet bent grass seed in Rhode Island for commercial use, J. A. DEFRANCE (*Rhode Island Sta. Misc. Pub.* 12 (1942), pp. [1]+5).—Suggestions for seedbed preparation, fertilization and liming, soil treatment, planting, care, maintenance, harvesting, threshing, and cleaning of velvet bentgrass to obtain pure seed, based extensively on research of the station, are outlined, together with directions by A. E. Stene for control of armyworm.

Germination of cottonseed as affected by soil disturbance and machine placement of fertilizer, H. P. SMITH, M. H. BYROM, and H. F. MORRIS (*Texas Sta. Bul.* 616 (1942), pp. 29, figs. 21).—Effects of machine placement of fertilizer and of soil disturbance on the germination of cottonseed were studied, 1936–40. See also an earlier note (E. S. R., 78, p. 407). The best germination and emergence were obtained when cottonseed were planted on a firm, undisturbed soil, and better stands were obtained with fertilizer placed 2 in. to the sides of the seed and 1 or 2 in. below the seed level. The highest yield was obtained at College Station when fertilizer was placed 2 in. to each side and 1 in. below seed level and at Nacogdoches when fertilizer was placed 2 in. to each side and 2 in. below the seed level, although fertilizer applied in any manner significantly increased yield at both stations.

Cotton irrigation investigations in San Joaquin Valley, California, 1926 to 1935, F. ADAMS, F. J. VEITHMEYER, and L. N. BROWN. (Coop. U. S. D. A.). (*California Sta. Bul.* 668 (1942), pp. 93, figs. 41).—Further irrigation investigations and experiments with cotton (E. S. R., 68, p. 470) were made, 1931–35, at other locations in San Joaquin Valley on soils of heavier texture than those at Shafter. The soil moisture record, 1927–35, is discussed in some detail for each year, with accompanying soil moisture charts for 1932–35, inclusive. The extent

to which the general objective of wet (the largest quantities of water), medium (intermediate), and dry (unirrigated) treatments was reached is summarized briefly.

When the principal plant responses, 1932-35, were considered as a whole, allowing soil moisture to remain at the permanent wilting percentage for extended periods in the upper 2 or 3 ft. of soil or allowing it to reach the permanent wilting percentage and remain there for extended periods during the last part of the season reduced plant heights and yields. Effects of withholding the first irrigation until August were not shown conclusively. Between the principal wet and medium treatments yields of neither group were consistently higher or lower than those of the other. Blossom counts (1932) and shedding of bolls and squares (1935) varied with irrigation rate, the highest count after the first peak of blossoming being in a wet treatment and the greatest shedding in a treatment receiving the least water. Data included on effects of irrigation on the quality of cotton produced were not considered conclusive.

The records led to the conclusion that on either the heavy or lighter soils of the experiments, cotton in San Joaquin Valley will use the equivalent of about 24 in. in depth, including both surface evaporation and plant transpiration, in producing normal yields. Data on water applied indicated that application of a depth of from 15 to 20 in. for heavy soils and from 20 to 25 in. on the medium and lighter soils is ample for cotton in this valley if there has been a preirrigation to a depth of 5 or 6 ft. of soil. The depth of water necessary to apply to wet the soil to 5 or 6 ft. before planting will depend in part on the depth of wetting by winter rainfall. If these soils are dry to a depth of 6 ft., the maximum preirrigation required should not exceed a depth of about 14 in. for heavier soils or about 11 in. for medium or lighter soils.

Varieties of flax that resist rust, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 1, pp. 29-31).—Varietal differences (E. S. R., 87, p. 217), especially in disease resistance and other agronomic characters, are restated for Buda, Viking, B. Golden, Smoky Golden, Walsh, and Biwing. Other varieties under test and promising experimental varieties being increased are mentioned briefly.

Annual lespedeza for Florida pastures (*Florida Sta. Bul.* 375 (1942), pp. 22, figs. 16).—This bulletin is in two sections.

For northwest Florida, J. D. Warner (pp. 4-10). Information is given on varieties, soils, and the fertilizer needs of lespedeza, and its use for permanent and temporary or rotated pastures in northwestern Florida.

For peninsular Florida, R. E. Blaser (pp. 10-21).—Preliminary fertilizer, inoculation, and variety tests, 1939-41, near Gainesville, Brooksville, Orlando, and Largo are reported, with advice on varieties, fertilizer, and cultural and management practices. Growth and composition data showed that the soil must be supplemented with Ca, P, and K to grow lespedeza. Good growth might be anticipated with a soil treatment of from 0.5 to 1 ton of lime and from 300 to 600 lb. of 0-16-8, 0-14-10, or similar fertilizer. In preliminary tests, high rates of rock or colloidal phosphates furnished ample P for lespedeza on sandy acid soils and also provided part of the Ca requirements, but liming gave improved growth. Treatment of basic slag and K, or lime, basic slag, and K resulted in satisfactory growth. Ca, P, and K contents of lespedeza were increased greatly by fertilization with those elements, and when superphosphate or K was omitted from the fertilizer P or K deficiency symptoms occurred. Kobe, common, and Tennessee 76 lespedezas made excellent growth when inoculated seed was planted on fertilized soil in early spring or late winter, while Korean was found unadapted.

Practical suggestions for establishing annual lespedeza pastures are appended.

Sorghums for Kansas, A. F. SWANSON and H. H. LAUDE. (Coop. U. S. D. A.).

(*Kansas Sta. Bul. 304* (1942), pp. 63, figs. 9).—A revision and enlargement of Bulletin 266 (E. S. R., 71, p. 625) with the results of varietal experiments at the station, substations, and outlying fields brought up to date. The better adapted grain sorghums in successive zones from east to west in Kansas include Standard Blackhull kafir, Red kafir, Pink kafir, Club, Western Blackhull, Finney milo, Wheatland, Early Kalo, Westland, and Colby, while feterita may be used as a catchcrop over much of the State. Among the better varieties suited primarily for forage are the larger, later, and higher-yielding sorts Atlas and Kansas Orange and the smaller, earlier types Early Sumac, Norkan, and Leoti Red. Sunrise is intermediate between forage and grain types. Kansas Orange appears best for sirup in eastern, southeastern, and south central Kansas, if planted at the normal time, and Atlas has also been used with success. Early Sumac and Leoti Red are good varieties in western and northwestern Kansas. Black Spanish is the leading standard type and Scarborough the leading dwarf type of broomcorn.

Soybean production in Kansas, J. W. ZAHNLEY (*Kansas Sta. Bul. 306* (1942), pp. 31, figs. 7).—This revision of Bulletin 282 (E. S. R., 81, p. 643) reports that the varieties A. K., Hongkong, Illini, Manchuk, and Pinpu currently are considered well suited to seed production in Kansas, and Laredo, Chiquita, Hongkong, and Peking have been good hay producers. Hongkong, A. K., and Laredo continued to be outstanding in southeastern Kansas in cooperative tests with farmers. Besides discussion of varieties, information is given on the adaptation and uses of the crop, methods and practices of growing soybeans for seed and hay and with corn, and on the control of rabbits, very destructive to young soybean plants. Yields of a few varieties of cowpeas, mung beans, and tepary beans are included.

Continuous wheat culture versus rotation wheat culture, H. L. WALSTER and T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 1, pp. 2-8, figs. 2).—During the period 1919-41, on unmaured land, wheat after corn averaged 24.4 bu. per acre, after clover 22.9, after peas 22.1, after rye 20.2, and after timothy or millet 16.3 bu. compared to continuous wheat in 6-in. drills 15.1 bu. The data suggested that the long-time effect of a crop sequence or of a rotation cannot be predicted from the results of a single year, either good or bad. Yields and May-July rainfall and temperature during the 10 best years indicated that a relatively dry July following abundant precipitation in June, or the combination of May and June, seems to favor high wheat yields, especially when associated with moderate temperatures that permit maximum filling.

Production and quality of grain in Knoxville trade area, C. E. ALLRED, B. H. LUEBKE, and M. B. JOHNSON (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 141* (1942), pp. IV+24, figs. 14).—The importance, trend, distribution, and possibilities of corn and small grain production in the 23 counties in the Knoxville area and the quality of grain received at the markets are reported from area surveys, and suggestions are given for improving the quality of the grain.

Seed inspection in Kentucky, 1941-42, W. A. PRICE, M. DIDLAKE, E. C. VAUGHN, E. DEEN, H. TILSON, A. McDANIEL, K. FRIED, M. MORTON, M. L. LITTELL, and L. BAUGH (*Kentucky Sta. Regulat. Ser. Bul. 33* (1942), pp. 35).—Germination and purity percentages and, when present, excessive quantities of noxious weed seed are reported for 544 official samples of agricultural seed obtained from dealers during the year ended June 30, 1942.

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul. 497* (1942), pp. 15).—Germination and purity guarantees and variations therefrom are tabulated and discussed from tests of 424 samples of field crop seeds and forage mixtures obtained from local dealers in Vermont during 1942.

Control of poison ivy (*Rhus toxicodendron*) by spraying, A. F. YEAGER and C. L. CALAHAN. (N. H. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.* 41 (1942), pp. 234-236).—Ammonium sulfamate was found a much more effective killing agent for poison-ivy than was sodium chlorate. The applications were effective when made at any time during the active growing period of the plant. The soil was not so severely sterilized by ammonium sulfamate as by sodium chlorate, and applications could be made to ivy growing on apple trees without injury to the tree provided the apple leaves were not sprayed.

HORTICULTURE

[**Horticultural studies by the Georgia Coastal Plain Station.** (Partly coop. Ga. Expt. Sta.). (*Georgia Coastal Plain Sta. Bul.* 32 (1941), pp. 77-83, 86-111, 135-139, fig. 1).—Herein are discussed the results of cultural and fertilizer studies with tomatoes, watermelons, lima beans, lettuce, and cabbage. Variety trials include the lima bean, snap bean, asparagus, beet, carrot, roasting corn, cantaloup, cucumber, peas, onion, and other vegetables, and among fruits the peach, pecan, pear, grape, fig, jujube, citrus, and miscellaneous other species. Some work was done on the adaptation of the blueberry and tung tree and the fertilizer and cultural needs of the pecan.

[**Horticultural activities by the Mississippi Station,** C. DORMAN (*Miss. Farm Res. [Mississippi Sta.],* 5 (1942), No. 10, pp. 4-5, 5 6).—Included are reports on the results of cultural and variety tests with vegetables and fruits at the Delta Substation; cabbage variety trials at the South Mississippi Substation; fertilizer, variety, and propagation studies with tung trees at the Experimental Tung Field; and fertilizer and variety trials with vegetables at the Truck Crops Substation.

[**Horticultural studies by the Ohio Station**] (*Ohio Sta. Bul.* 617 (1940), pp. 23-34, 34-36, 36-39, 40-44, figs. 4).—Included are progress reports on the following studies: Nutrient requirements of greenhouse tomatoes; movement of potassium fertilizer in orchard soils; production of mulch materials in the orchard; effect of ringing on the fruit set of the apple; the most productive age of apple trees; proper time to pick red strains of apples; use of indolebutyric acid in the production of seedless tomatoes; fertilizers for greenhouse tomatoes; the relation of soil fertility to the food value of the tomato; development of tomatoes, cucumbers, and lettuce varieties for greenhouse culture; comparison of direct seeding and transplanting of tomatoes; relation of midsummer seeding on muck soil to stand of plants; fertilizers for early vegetable crops; gravel and cinder culture of greenhouse flowers; effect of excessive fertilizer applications on flowers; culture of flowers in cloth houses; solutions for prolonging the life of cut flowers; the use of growth substances in the propagation of ornamentals; the use of chloropicrin for sterilizing soil in the greenhouse and in the field; and the effect of soil reaction on outdoor roses.

[**Horticultural studies by the Rhode Island Station**] (*Rhode Island Sta. Rpt.* [1941], pp. 17-23, 34-36, 38-40, 47-49, 52-55).—Included are progress reports upon the following investigations: Fertilizer, variety, and cultural trials with vegetable crops (coop. Mass. and Conn. Expt. Stas.), the breeding of eggplants for resistance to *Phomopsis* blight, the effect of carbon black on germination and yield of table beets, application of nitrate of soda to table beets, rotations for onions, relationship of glutamine and asparagine in vegetable plants, causes of "hollow stalk" in celery, use of hormone sprays to reduce the pre-harvest dropping of apples, soil management of the peach orchard, and apple growth as affected by sprays.

Inspection, certification, and transportation of nursery stock in Kentucky, with a brief report for the year ended June 30, 1942, W. A. PRICE

and H. G. TILSON (*Kentucky Sta. Regulat. Ser. Bul. 32 (1942), pp. 18*).—As usual (E. S. R., 87, p. 60), this contains administrative information relative to certification, the status of certain insects and diseases, certified nurseries, etc.

Propagation by grafting and budding, H. G. SWARTWOUT (*Missouri Sta. Cir. 241 (1942), pp. 11, figs. 7*).—Information is offered on the art and practices of various types of grafting and budding.

Effect of fertilizer placement on snap beans, lima beans, and peas, M. M. PARKER (*Virginia Truck Sta. Bul. 107 (1942), pp. 1757-1781, figs. 5*).—The largest average yields of snap and lima beans and peas were obtained from placing fertilizer in bands 2 in. to each side and 2 in. below the level of the seed. The smallest yields were obtained when the fertilizer was placed in a band directly below the seed and when mixed with the surface soil at the time of planting. Intermediate yields followed the placement of the fertilizer on top of the row after planting or when used as a side dressing. The poorer results of placing fertilizer directly below the seed or mixing it with the surface soil were due principally to injury to the germinating seed and the young seedlings. Side applications were relatively ineffective because of the slowness with which the nutrients became available to the plants. In all placements a 6-12-5 material was used at the rate of 1,000 lb. per acre. Injury was most severe in soils with a low moisture content during the period of germination.

Depth-of-planting studies with asparagus in California, G. C. HANNA and H. A. JONES. (Calif. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 498-500*).—At Davis, Calif., Palmetto asparagus plants spaced 2 ft. apart in the row and rows 7.5 ft. apart were planted 8 and 12 in. deep. At Ryer Island plants were set 4 to 5, 7 to 8, and 11 to 12 in. deep. Yield records showed no advantage from deep planting at either location and an actual decrease from deep planting in the heavier soil at Davis. There was a tendency for larger spears from deep planting at both locations. At Davis the shallower-planted crowns tended to produce a larger early crop than did the more deeply planted crowns.

The Penn State Ballhead cabbage: Some problems encountered in its development, C. E. MYERS. (*Pennsylvania Sta. Bul. 430 (1942), pp. [2]+52, figs. 48*).—A historical account is given of the development of a variety of cabbage which has won wide recognition for its superior qualities. Various difficulties encountered, such as the overwintering of mother plants and the induction of satisfactory sets of seed, are discussed in some detail, with a view to helping other plant breeders. The best method of overwintering, trenching in soil, is described. Comparisons of line-bred and inbred strains with other crosses showed the possible use of the latter method to obtain increased yields of seed. Little, if any, correlation was found between shape and weight of heads.

Sponges from a vine, B. Y. MORRISON (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas, 2 (1942), No. 11, pp. 215-216, figs. 2*).—Information is presented on the culture, handling, and uses of the luffa, or "dishrag" gourd.

A trial of new varieties of hops for New York, J. D. HARLAN (*New York State Sta., Better New York Hops, 3 (1942), No. 4, pp. 28, fig. 1*).—This mimeographed report presents the results of variety tests conducted largely in an experimental hopyard located in Oneida County. Information is presented on climatic conditions, cultural operations, yields, resins contents, and general characteristics of the varieties.

Lettuce production under Mississippi conditions, I. R. FARISH (*Mississippi Sta. Cir. 107 (1942), pp. 8, figs. 5*).—Information is presented on the status of lettuce growing in the State, varieties, climatic requirements, soils, planting methods and practices, culture, and harvesting and marketing.

Weed control in onions with dilute-sulfuric-acid spray, A. G. NEWHALL, G. H. M. LAWRENCE, and O. L. JUSTICE ([*New York*] *Cornell Sta. Bul.* 784 (1942), pp. 27, figs. 10).—A method is discussed of spraying onions in late May with dilute sulfuric acid to kill annual weeds with a minimum damage to the onions. A cheap technical grade of acid, testing 66° B., with a specific gravity of approximately 1.84, was used. The most satisfactory dilutions were from 2 to 2.5 percent by volume, and the best quantity per single application was between 90 and 125 gal. of spray per acre. The most effective time to spray was on a warm day between the twentieth and thirtieth days following seeding, the exact date depending on the stage of development of the plants. At least three factors governed the proper timing, namely, the stage of development of the onions and of the weeds and the prevailing weather. Dilute sulfuric acid was found more reliable and less harmful to the onions than iron sulfate, Atlacide, Sinox, or cyanamide. At the strengths and quantities recommended it was necessary to hold the nozzles close to the soil so that a strip of only from 3 to 4 in. wide was sprayed. Considerable difference was noted in various weeds and grasses as to coverage. A certain amount of hand weeding was necessary to supplement the spray.

Onion seed production in Idaho, G. W. WOODBURY and C. F. DIETZ (*Idaho Sta. Bul.* 247 (1942), pp. 14, figs. 3).—Information is presented on the methods of producing onion seed, supported by certain experimental findings. In many locations in Idaho, onion bulbs may be set in the field in the fall, and such practice is recommended for the hardier kinds, such as Ebenezer, White Portugal, and Yellow Globe. Records taken at Parma over the 4 yr. 1938-41 showed with few exceptions significant increases in seed yield in favor of fall planting, particularly in White Portugal and Ebenezer. Sweet Spanish, while not as hardy, survived most winters but entailed some chance when planted in the fall. Comparisons of September 15, October 15, and November 15 indicated that the earliest planting date was desirable. With spring planting the early setting was also desirable. There was some evidence that large-sized bulbs were more productive of seed than were smaller sizes. It was clear that bulb size was related directly to the number of flower clusters produced.

Irrigation of seed and canning peas in the Gallatin Valley, Montana, O. W. MONSON (*Montana Sta. Bul.* 405 (1942), pp. 23, fig. 9).—Timeliness of irrigating was found to be important, with the largest yields of seed and canning peas being obtained when irrigation was deferred until the plants were in bloom. Earlier irrigations were advisable only when soil moisture was low enough to check growth. Nothing was gained by applying more water than the soil could retain for the use of the crop. Frequent irrigation was unnecessary during years of average rainfall, but when a lack of soil moisture checked growth in the early season follow-up irrigations at intervals of 10 to 14 days were needed to maintain favorable growth. On clay soils flooding caused puddling of the soil, and applications by the corrugation method were more effective. On loam soils, the flooding method was satisfactory. Heavy irrigations were not harmful when good drainage conditions existed, but waterlogging was definitely injurious. Irrigation tended to cool the soil to a depth of at least 16 in., and this effect was measurable for as long as 26 days. Canning peas were found to contain calcium, iron, phosphorus, and nitrogen in various amounts. Irrigation before bloom increased the contents of phosphorus and nitrogen; irrigations at early bloom increased the iron content and irrigations at full bloom increased the amount of calcium. Heavy seeding tended to increase yields sufficiently to more than compensate for the increased cost of seed and at the same time the heavier stands of plants helped to suppress weeds, which were chiefly wild oats and sweetclover.

The tomato, P. WORK (*New York: Orange Judd Pub. Co., 1942, pp. 135, figs. 27*).—Prepared by a member of the staff of the [New York] Cornell Experiment Station, this book contains information relating to soils, fertilizers, culture, varieties, control of pests, etc. A list of selected references to the literature is included.

Some new research phases in greenhouse tomato production, I. C. HOFFMAN. (Ohio Expt. Sta.). (*Veg. Growers Assoc. Amer. Ann. Rpt., 1941, pp. 215-226*).—Activities in breeding and selection of greenhouse tomatoes, testing of different types of soil, methods of seed sowing and plant production, effect of different light intensities, methods of culture, pollination requirements, etc., are discussed.

Use of chemicals to stimulate fruitfulness in tomatoes, F. S. HOWLETT. (Ohio Expt. Sta.). (*Veg. Growers Assoc. Amer. Ann. Rpt., 1941, pp. 203-214, figs. 4*).—Of various chemicals tested as agents for influencing the fruit set and development of tomatoes, indolebutyric acid was found outstanding. Throughout the experiments the fruits produced by this acid were as large as, or larger than, those produced in the same cluster following normal pollination, with the greatest improvement occurring during the period from January through February when little pollen may be viable. Indolebutyric acid in lanolin paste at 0.3 percent concentration was a standard with which other materials and concentrations were compared. Almost invariably the effect of treating flowers during February and March with indolebutyric acid was the development of gelatinous tissue within the locules, despite the absence of seeds. When the paste is used, the style must be largely removed and the material applied at the cut end, a procedure which restricts the commercial adoption of the technic. At present the procedure is largely employed as a means of supplementing pollination and fertilization, since seedless tomatoes are not demanded by the trade. There was some indication that spraying might be the eventual method of application.

Factors influencing shoulder bruises of green-wrap tomatoes, J. M. LUTZ. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 455-459, figs. 3*).—Shoulder bruising, the most common type of injury to packed tomatoes, does not appear serious on mature green fruits but becomes conspicuous as ripening proceeds. Such injury may be caused by the abrasive action of the rough sides and bottoms of field crates. The tightness of the pack had little effect on the amount of shoulder bruising. Paper wraps tended to reduce bruising in transit. The planing of the boards used in making boxes and the use of corrugated paper or other protective materials tended to reduce injury.

Time interval between full bloom and fruit maturity for several varieties of apples, pears, peaches, and cherries, H. B. TUKEY. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 133-140*).—Data assembled from records taken by the station over a long period of years are presented in tabular form, with discussion. The interval of elapsed time between blooming and maturity was more nearly constant for apples, followed in order by the pear, peach, and cherry. That the intervals of elapsed time between bloom and maturity in different seasons more closely approximated each other than do calendar dates, was true whether the seasons were early or late. There appeared to be a greater variation in total elapsed time from bloom to fruit maturity in early-maturing than in late-maturing varieties of a given species. The author suggests that the timing of orchard operations, such as fruit thinning, irrigation, spraying, and cultivation, might well be based on the stage of development of the fruit rather than upon calendar dates.

The orchard fertility problem during the war emergency (Pennsylvania Sta. Bul. 431 (1942), pp. [2]+12, figs. 10).—During 34 yr. of tests, legume sods,

kept under control by annual light harrowing and by mowing, and annual legume covers worked down in the spring and immediately reseeded resulted in the production of as satisfactory apple crops without the use of commercial nitrogen fertilizers as nonlegume sods or covers with added nitrogen. In the peach orchard a similar use of annual legume covers with moderate use of commercial nitrogen also proved desirable. Good legume covers required lime, phosphate, and potash. With nonlegumes, or with legumes too thin to supply nitrogen, applications of commercial nitrogen are necessary. During the present emergency, ring applications are suggested as a means of making more effective the smaller amounts of commercial nitrogen available.

Quantitative distribution of nitrogen and carbohydrates in apple trees, A. E. MURNEEK (*Missouri Sta. Res. Bul. 348 (1942), pp. 28, figs. 10*).—From October to December, leaf samples were collected for analysis from two trees each of the 18-year-old Grimes Golden, Jonathan, and Delicious. The trees were then dug and the tops and roots separated into various integral portions. The total weight of the trees ranged from 850 to 1,000 lb., of which from 20 to 30 percent was in the roots. Approximately, from 62 to 65 percent of the tops and from 53 to 57 percent of the roots was made up of dry matter. Roughly 30 percent of the dry weight of the tops and 40 percent of that of the roots represented available carbohydrates, such as hemicellulose, starch, and sugars. There was about three times as much starch in the roots as in the tops. The trees contained about 2 lb. each of nitrogen, of which 75 percent was in the above-ground portion. Autumn migration of nitrogen and carbohydrates in the period between October and December was clearly evident in the trees. Nitrogen moved from the leaves into the twigs, and thence into the older wood and roots. Alterations in and migration of carbohydrates in the fall and early winter were somewhat difficult to ascertain. There was a sharp increase in sugar concentration, throughout the tree, between the middle of October and the end of December with a corresponding reduction in starch, ascribed to hydrolysis of the starch caused by the relatively low temperatures.

Comparison of certain varieties as pollenizers for the Delicious apple, W. H. GRIGGS and A. L. SCHRADER. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 87-90*).—Several varieties, including Golden Delicious, Williams, Winter Banana, Jonathan, Lowry, Yellow Transparent, Rome Beauty, Gallia Beauty, and York Imperial, were tested in 1940 as pollenizers for Delicious. Because of the apparent inadequacy of the data, the project was repeated in 1941 with more replications using five pollenizers—York Imperial, Rome Beauty, Gallia Beauty, Jonathan, and Golden Delicious. In this second trial Rome Beauty, Gallia Beauty, and Jonathan gave slightly higher sets than did Golden Delicious and York Imperial. As a result the authors recommend the first three for pollenizers for Delicious, and suggest that some of the earlier pollination work may have been misleading because of inadequate replications or proper statistical treatment of the data.

Gross morphology and histology of developing fruit of the apple, H. B. TUKEY and J. O. YOUNG. (N. Y. State Expt. Sta.). (*Bot. Gaz., 104 (1942), No. 1, pp. 3-25, figs. 69*).—The results are presented of a study of the fruits of five apple varieties, Lodi (very early), Early Harvest (early), Twenty Ounce and McIntosh (midseason), and Rome Beauty (late), collected in the station orchard at various stages of development from 1 mo. before full bloom to maturity.

Influence of boron application on preharvest drop of McIntosh apples, A. J. HEINICKE, W. REUTHER, and J. C. CAIN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 31-34*).—Records taken on a block of 20-year-old McIntosh trees in the Cornell University orchard indicated that borax applications to trees susceptible to cork reduced the preharvest drop as well as the drop

through harvest as compared with trees not receiving borax. The moderate application of boron to trees previously free from cork had no definite effect. Leaf analyses indicated that boron content was relatively low before application, even in leaves of trees showing no deficiency symptoms. There was a definite increase within 6 weeks, especially on trees which bore few or no apples showing surface cork. The boron content of the leaf tissues of normal trees tended to increase as the season advanced. Determination of boron in apparently healthy fruits from limbs of four trees having at least 5 percent of the apples with cork averaged 2.48 p. p. m. in the dry matter as compared with an average of 5.43 p. p. m. for fruits from limbs on the same trees on which none of the fruits showed deficiency symptoms.

Some results in controlling the pre-harvest drop of apples, M. B. HOFFMAN, L. J. EDGERTON, and A. VAN DOREN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 35-38).—Comparisons of naphthaleneacetic acid applied as a spray and as dust to Williams apple trees revealed both types of application to be about equally effective in reducing preharvest drop. In an experiment with vigorous 16-year-old McIntosh trees in the Hudson River Valley, the dust was fully as effective in drop control as was the liquid spray. With 18-year-old McIntosh trees in western New York the average drop for the checks was 11.9 percent, single application of liquid 5.5, double application of liquid 3, single application of dust 5.2, and double application of dust 2.9 percent. There was some indication that the initial applications were some 4 days too early for optimum effects. In the case of Baldwin apples which had started to drop before attaining satisfactory color, dust and liquid reduced dropping in about the same degree. Some evidence was obtained that naphthaleneacetic acid was beneficial in reducing the drop of Northern Spy apples. Weather conditions were apparently important in influencing the drop of apples, and proper timing of sprays or dusts was important in determining their beneficial effects.

Further studies on the control of preharvest drop of McIntosh, L. SOUTHWICK. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 39-41).—A comparison of sprays and dust applied in equivalent amounts of active ingredients to McIntosh trees indicated that the sprays were somewhat more effective than the dust in reducing the preharvest drop. In one trial, the use of a small amount of summer spraying oil to the liquid failed to improve control to any significant degree. Unfavorable results were obtained where a satisfactory type of sticker was added to the standard spray. Good results obtained with a late spray gave some indication that hormone sprays, even when applied rather late, may be helpful in decreasing the subsequent dropping of the McIntosh apple. This is a continuation of previous work (E. S. R., 86, p. 45).

Further studies with preharvest sprayed McIntosh apples, L. M. MURPHY. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 42-44, figs. 2).—All of three experiments, namely, one spray at 5 p. p. m., one spray at 10 p. p. m., and two sprays 4 days apart and of 5 p. p. m. concentration each, reduced the preharvest dropping of McIntosh apples from trees 22 yr. of age and carrying an average crop of 10.2 bu. per tree. The differences between sprays were not significant. Of three spraying dates, namely, September 9, 11, and 13, the first was significantly more effective, emphasizing the importance of proper timing. While the repeated application did not lengthen the effective period, this treatment gave better coverage and increased the chances of correct timing. This is a continuation of previous work (E. S. R., 86, p. 193).

Temperature in relation to effectiveness of preharvest drop sprays on apples, L. P. BATJER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 45-48, figs. 2).—In experiments with Williams, Delicious, and Stayman Wine-sap apple trees, in which preharvest sprays of naphthaleneacetic acid were applied

at different times of day when different temperatures existed, it was evident that sprays applied at midday were more effective in certain concentrations than when applied in early morning under cooler conditions. With Williams, a variety extremely responsive to hormone sprays, temperature differences were obtained only when the concentration was below 5 p. p. m. With Delicious and Stayman Winesap, both 2.5 and 5 p. p. m. sprays were generally more effective when applied at the higher temperatures. Early-morning sprays required nearly 1 hr. to dry as compared with 0.5 hr. at noon. Apparently, however, absorption was much more rapid at the higher temperatures. Some work upon the effect of temperature on the persistence of sprayed leaf petioles suggested that approximately 75° F. may represent the critical point above which temperature may not be an important factor.

More or less water-core, W. A. RUTH. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 75 (1941), pp. 143-149).—Water core is stated to be a serious problem with Duchess apples in the Ozark section of Illinois and with Willowtwigs in western Illinois. An examination of the fruit of seven Duchess trees at Urbana showed more water core present in the crop of those trees bearing lightly. On all the trees, the well-colored apples and those with red-tinted flesh tended to have more water core. There was no correlation between size of fruit and water core. Apparently a high leaf:apple ratio favored the development of water core, but various other factors were involved.

External factors affecting water loss from apples in cold storage, S. A. PRENIAZEK. (R. I. Expt. Sta.). (*Refrig. Engin.*, 44 (1942), No. 3, pp. 171-173).—The rate of transpiration of apple fruit was found to be directly proportional to the water pressure deficit of the air. The amount of loss per unit of vapor pressure deficit was constant within the ranges of temperature and relative humidity studied. The observations were true only when the transpiration rate was determined for short periods of time directly after the fruits were brought under controlled conditions. When apple fruits are transferred to high temperatures and the low ranges of relative humidity, the time factor became apparent. The effect of air movement on the rate of transpiration of apples is negligible, amounting to about 5 percent at the most provided that temperature and relative humidity are uniform throughout the storage chambers.

Mealiness and quality in Delicious apples as affected by certain orchard conditions and storage techniques, D. V. FISHER. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 128-132).—Delicious apples harvested in a mature state had excellent flavor but were susceptible to mealiness. Immature apples, although less susceptible to mealiness, did not develop the characteristic varietal flavor. Iodine tests showed a marked decrease in starch in apples harvested in the mature stage. Respiration rates at 60° F. were twice as great as at 40° and three times as great as at 32°. The disappearance of starch and the hydrolysis of protopectin to soluble pectin were found useful indicators of the progress of ripening in the Delicious apple. The storage of apples in atmospheres containing 2.5 percent O₂ and 97.5 percent N₂ at 32° or 40° inhibited softening and increased greatly storage life. Determinations of sugars, acids, and alcohol-insoluble residues, both at the time of removal from storage and after periods at 60° in air, failed to reveal any significant differences in chemical composition between fruits stored in air or in any of the modified atmospheres used.

Influence of controlled-atmosphere storage on respiration of McIntosh apples, R. M. SMOCK. (Cornell Univ.). (*Bot. Gaz.*, 194 (1942), No. 1, pp. 178-184, figs. 4).—McIntosh apples respired approximately one-third as fast in controlled-atmosphere storage at 40° F. as in ordinary cold storage at 32°, and when

removed from storage in controlled atmosphere did not respire as rapidly as those removed from ordinary cold storage. Apples held in cold storage at 32° evolved 2.5 and 3.0 times as much CO₂ during the same period as did controlled-atmosphere fruits.

Experiments with sprays in the control of preharvest drop of Bartlett pears in California. A. E. DAVEY and C. O. HESSE. (Univ. Calif. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 49-53, fig. 1).—Experiments conducted in two different years showed that preharvest sprays were successful in reducing the drop of Bartlett pears. Under all controls, an average of more than 3 or 4 days was necessary for the expression of the influence of the sprays. The drop after treatment with chemicals at the strengths of 10 and 5 p. p. m. was reduced to about 50 percent of that on untreated trees. In one instance where naphthaleneacetic acid was used, the drop was reduced to about 33 percent of that in the checks.

Initiation of peach flower parts. R. S. PICKETT. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 111-112).—In 1940, the buds of the Dr. Burton peach showed no signs of flower differentiation at Iowa Park, Tex., until August 10. In 1941, no differentiation was observed in Mayflower, Early Rose, Dr. Burton, Frank, Dee Lee Cling, Smith (a honey peach), and an unknown on August 4. On August 15, flower parts were well advanced in Early Rose and were evident in Dr. Burton. On September 3 the typical primary stage was seen in Frank, and on September 13 the varieties Dee Lee Cling, Mayflower, and the unknown showed flower primordia. Mayflower, one of the earliest to mature fruits, was among the latest to develop flower parts, suggesting an absence of any correlation between the time of fruit maturity and flower initiation.

Comparative transpiration rates of peaches and citrus. R. F. CAIN. (Tex. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 79-83, figs. 2).—Transpiration readings taken on 2-year-old Marsh seedless grapefruit, Valencia orange, and Southhaven and Texaberta peach trees, growing in 5-gal. cans containing Lufkin fine sandy loam, showed marked differences between species and between varieties. The mean daily absolute transpiration of the Texaberta peach was over twice that of the Southhaven variety, and the transpiration of the grapefruit was higher than that of the orange. Orange plants ceased transpiring 2 hr. earlier in the evening and resumed transpiration 1 hr. later in the morning than did the grapefruit. There was no evidence of time differences between the two peaches. The grapefruit and the peaches responded quickly to illumination, while the orange was much slower in response.

Effect of nitrate of soda on development of the Halehaven peach. R. V. LOTT (*Illinois Sta. Bul.* 493 (1942), pp. 321-384, figs. 11).—The seasonal development of the fruit from the time of full bloom to maturity was followed in two adjacent 6-year-old Halehaven peach trees, one of which was unfertilized and the other given two 5-lb. applications of nitrate of soda, one on March 28, 17 days before full bloom, and one on June 4 when the stones were beginning to harden. Measurements of fruit diameters, volume, or fresh weight revealed three distinct periods of development. The first, which ended 57 days after bloom, was characterized by a rapid increase in size and fresh weight of flesh, stone, and kernel; the second, which ended about 76 days after bloom, was characterized by a slow rate of increase in size of flesh, stone, and kernel; and the third period, extending to the soft-ripe stage, was characterized by an accelerating increase in size and in dry matter of the flesh. The transition from one period to another was not abrupt. The effect of the nitrate on the fruit was not apparent until about 3 weeks before harvest, when the control fruits developed more rapidly for a few days and were then surpassed by the fertilized fruits. The nitrogen treatment induced greater vigor of growth, larger yields,

larger fruits, and more fruit buds for the succeeding year. There were higher percentages of starch, dextrin, ash, and nitrogen and lower percentages of reducing sugars and hemicelluloses in the flesh of the nitrated fruits.

The relation between diameter and fresh weight of developing peach fruits, L. D. DAVIS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 146-152, figs. 5).—Samples of 50 fruits, harvested at about weekly intervals from a few weeks before pit hardening until maturity, were weighed, and each of the diameters—suture, cross, and length—was measured. When the average cross or suture diameter was plotted against the average weight, a smooth curve resulted which became a straight line when the logarithms of the variables were used. The relation between average length diameter and the average weight was not as regular as that between the other two diameters and the weight. The scatter of points about the calculated line of best fit was such as to suggest that 50 fruits are adequate to represent the population. There was excellent agreement among the equations for replications within a variety, either from different locations in one season or many seasons. When compared with the weight the cross diameter has the greatest seasonal change of the three diameters, the suture next, and the length diameter the least.

Propagating peach plums by cuttings, W. L. DORAN and J. S. BAILEY. (Mass. Expt. Sta.). (*Amer. Nurseryman*, 76 (1942), No. 6, p. 7).—Softwood cuttings taken in mid-June and consisting of entire but short new shoots or laterals about 4 in. in length, with the basal cut at the base of the current season's growth, gave good results when treated with a root-inducing substance. The rooting medium was a mixture of two parts of sand and one part of peat moss. In one case 67-percent rooting was obtained in 25 days where the basal ends had been immersed in a solution of indolebutyric acid for 4 hr. prior to planting. Rooted cuttings transplanted to a sandy soil made from 3 to 4 in. of new growth by the middle of August.

The effect of deflorating or defruiting upon blossom bud differentiation in the Sugar prune, L. D. DAVIS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 126-127).—At the approach of full bloom, flowers were removed from unringed branches of the Sugar prune, a variety that often alternates completely. Very small branches, such as individual spurs and up to 1 ft. in length, formed no buds. Branches of intermediate size formed small percentages of flower buds. Branches from 1.5 to 2.0 in. in diameter formed 90 percent, and larger branches formed 100 percent flower buds following defloration. Where half of a tree was deflorated, the treated half produced flower buds and the rest of the tree none. Some of the deflorated portions remained out of phase with the rest of the tree for only a single season. In other cases, 4 or 5 yr. elapsed before normality was resumed. As to the most effective time for defloration or defruiting, flower buds were formed when treatments were applied within a period of from 30 to 40 days after full bloom, except in 1935 when the limit was 14 days. Ringing extended the duration of the effective period for defruiting on 2-in. branches.

Note on the pollination of the Italian Prune, L. H. MACDANIELS. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 84-86).—Evidence obtained from self- and cross-pollinations, employing the branch-unit method, indicated that the Italian Prune as grown at Ithaca, N. Y., is at least partially self-fruitful, but that the set may be increased by cross-pollination with compatible varieties. In the 2 yr. 1938 and 1939 flowers exposed to open-pollination set the highest percentage of fruits, and those crossed with varieties such as Stanley, Imperial Epineuse, and Agen set more fruit than did selfed blooms.

Growing raspberries and blackberries, H. G. SWARTWOUT and W. R. MARTIN, Jr. (*Missouri Sta. Bul.* 450 (1942), pp. 32, figs. 16).—Information is pre-

sented on the status of production, locating the plantations, soils and their preparation, varieties, methods of propagation, planting, culture, fertilizer requirements, pruning, training, control of diseases and insects, methods of harvesting and handling the fruit, etc.

Fertilizing strawberries in North Carolina, R. A. LINEBERRY and E. R. COLLINS. (Coop. U. S. D. A.). (*North Carolina Sta. Bul.* 332 (1942), pp. 20, figs. 11).—Nitrogen at approximately a 5-percent level gave good results when used with 8 percent phosphoric acid and 6 percent potash. In three of the four trials, 8 percent phosphoric acid in the ratio produced higher yields than none or 4 percent. In one of the four trials, increased yields were obtained from the potash contained in the fertilizer. As to time of application, no consistent increases in yield were shown for any specific time of applying a complete fertilizer, whether applied in a single or in split treatments. There was evidence that some of the fertilizer should be applied by September or October, during the fall growing season. Supplementary spring applications of soluble nitrogen increased total yields but delayed ripening and lowered keeping qualities. A relationship was shown between soil reaction and plant survival, with a larger percentage of loss associated with the more acid areas of individual fields. Applications of sulfur and physiologically acid fertilizers increased the number of dead plants. Limestone applications increased yields on the fields included in the investigations.

Growth and fruiting of the cranberry, R. H. ROBERTS and B. E. STRUCKMEYER. (Wis. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 373-379, figs. 8).—Large yields of fruits were obtained when the average growth of the upright shoots was between 2.5 and 3.5 in., and when there were between 200 and 300 of such uprights per square foot. As the number of uprights increased the length also increased, apparently caused by shading. The production of a good cranberry crop appeared to depend more upon the set of blossoms than upon blossom bud formation, which was usually abundant. Poor crops on strongly vegetative uprights in dense stands appeared to be due to both shading and poor pollination. Apparently the agitation of the flowers by some agent such as a breeze was sufficient for pollination, which is apparently brought about by wind-borne pollen. Insects function apparently by jarring the blossoms rather than contacting the stigmas. The pollen grain is a tetrad capable apparently of developing into four functional pollen tubes. Fruits may form with very few seeds, in fact seedless fruits were not uncommon. Cranberry pollen does not shed readily when the blossoms are in damp situations.

Effect of nutrients, media, and growth substances on the growth of the Cabot variety of *Vaccinium corymbosum*, A. KRAMER and A. L. SCHRADER. (U. S. D. A. and Md. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 7, pp. 313-328, pl. 1, figs. 5).—Cabot plants grown in crocks containing quartz sand and quartz sand plus a top layer of peat were supplied nutrient solutions so modified as to cause deficiencies in various nutrients. With complete nutrients the plants grew vigorously and developed large green leaves similar to those of plants grown outdoors under optimum conditions. The plants in the peat-on-sand series were even more vigorous, and this was true both for those receiving the full nutrient solution and those deprived of a single element, except K. Nutrient deficiencies of certain elements did not appear as early in the peat-sand as in sand alone. The absence of Ca, Fe, or of S did not cause deficiency symptoms in the peat-sand cultures throughout the life of the experiment. With the above exceptions, deficiency symptoms appeared after different lengths of time in both media in the following order: N, K, S, Ca, B, Mg, P, Fe, and Mn. The beneficial effect of peat was due partly to the presence of Ca, B, and S in the available form and partly to undetermined

causes. The deficiencies, particularly of N, K, B, S, Mg, and P, were sufficiently characteristic to be easily identified. The shoot: root ratio of plants in peat-on-sand was increased greatly when Mg, Fe, Ca, B, or Mn was omitted and decreased when S, B, P, or N was withheld from the sand cultures. A lack of N increased significantly the rapidity with which terminal growing points aborted. Weekly applications of thiourea and vitamin B₁ had no significant effect on deficiency symptoms, fresh or dry weight of the plants, or growing-point abortion. Eight other substances applied to plants growing in silt loam had no significant effect.

Crown budding for healthy Hevea, H. G. SORESENSEN (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Americas*, 2 (1942), No. 10, pp. 191-193, figs. 5).—The production of rubber in Latin America is impeded by the leaf blight fungus *Dothidella ulci* which is carried from tree to tree by wind-blown spores. The development of clones or strains of *H. brasiliensis* with combined resistance and high yield is the ultimate object, but in the interim crown budding offers a workable means of utilizing imported clones that could not otherwise exist in disease-ridden areas. In crown budding, a disease-resistant crown is budded on a high-producing trunk which, in turn, has been budded on a seedling rootstock. The result is a three-part rubber tree consisting of a root, trunk, and top all derived from different sources. The technic of developing such composite trees is described in detail. In addition to aiding in disease control, crown budding is useful in breeding as the tops come into flower within 3 yr. as compared with 6 or 7 yr. when budded on ordinary rootstocks.

Fertilizer results with tung trees and recommended cultural methods, W. D. KIMBROUGH, J. C. MILLER, and W. F. WILSON (*Louisiana Sta. Bul.* 352 (1942), pp. 16, figs. 3).—In connection with information on culture, propagation, methods of transplanting, harvesting, storage, etc., the authors present the results of fertilizer experiments. In a series of plats on Ruston fine sandy loam near Bogalusa, there was noted a direct positive correlation between the amount of fertilizer applied and increase in growth and yield. P and N were found to be especially deficient, with no benefit from K. The need of N became more acute after the first crop of nuts was harvested. In another experiment a complete fertilizer was found necessary for the best growth and highest yield, with indications that K, though beneficial, was less necessary than P and N. No consistent significant differences were found in the oil content of the nuts or in the quality of the oil attributable to differential fertilizer treatments. Records on yield of individual trees showed great variation under comparable conditions.

Effects of growth-regulating substances on shoot development of roses during common storage, P. C. MARTIN. (*U. S. D. A.*). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 26-49, figs. 14).—Experiments conducted during two storage seasons indicated that growth-regulating substances will inhibit vegetative buds so that the plants remain dormant through the normal storage season. Three compounds, naphthalenemethylacetate, naphthalenethylacetate, and naphthaleneacetonitrile, inhibited effectively the growth of buds for from 40 to 60 days in common storage. In general an application appeared to be most effective when a continuous supply was present at or near the inhibited buds. The food reserves (starch) of treated bushes were conserved while in storage, either by direct inhibition of the treatment on starch hydrolysis or by the prevention of shoot growth which utilizes the available reserves. As a result, treated plants after storage produced much greater root and top growth and more and better flowers than did the untreated controls.

Growing ornamental greenhouse crops in gravel culture, D. C. KIPLINGER and A. LAURIE (*Ohio Sta. Bul.* 634 (1942), pp. [1]+52, figs. 24).—This revision

of an earlier bulletin (E. S. R., 84, p. 765) presents, in the same general manner, information regarding the growing of greenhouse plants with nutrient solutions, with added facts relative to recent developments in methods and applications.

Herbaceous perennials for North Carolina, G. O. RANDALL and J. G. WEAVER (*North Carolina Sta. Bul. 333 (1942), pp. 40, figs. 35*).—Information is presented on propagation by seeds, cuttings, division, and layerages; soils and fertilizers; planting and culture; and on various perennials which have been tested and found adapted to North Carolina conditions.

An illustrated guide to identification and landscape uses of Mississippi native shrubs, F. S. BATSON (*Mississippi Sta. Bul. 369 (1942), pp. [2]+61, figs. 60*).—Information is presented on the growth and flowering habits and possible landscape values of a number of Mississippi plants.

FORESTRY

Farm forestry studies by the Delta Branch Station, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 10, p. 4*).—Information is presented on timber stand improvement, planting trials, and fence post tests.

[**Forestry activities by the Ohio Station**] (*Ohio Sta. Bul. 617 (1940), pp. 73-78, figs. 2*).—General information is presented with reference to forest protection activities, recreational developments in the State forests, survey of forest plantations, etc.

Sex and vegetative propagation, A. G. SNOW, JR. (U. S. D. A.). (*Jour. Forestry, 40 (1942), No. 10, pp. 807-808*).—Cuttings taken from male trees rooted better on the average than those from female red maple trees, although there were both high- and low-rooting clones in both sexes. The possibility is suggested that this relationship is associated with nutritional factors conditioned by the increased drain on foods in the maturing seeds.

Changes within the seeds of *Juniperus scopulorum* during the processes of after-ripening and germination, M. AFANASIEV and M. CRESS. (Okla. A. and M. Col.). (*Jour. Forestry, 40 (1942), No. 10, pp. 798-801*).—Observations on the seed of *J. scopulorum*, a species which does not germinate during the first spring but does germinate freely during the second, showed the food reserves in the dormant seeds to be in the form of fats and proteins. Neither sugars nor starch were detected. Peroxidase was found in small amounts, while oxidase was absent or inactive. Catalase activity was very pronounced, even in dormant seeds. The kernel of the seed was slightly acid, 6.4 to 6.9 pH. The changes recorded in afterripened seeds just before and during germination were a rapid increase in moisture, a slight increase in sugar and oxidase, an increase in peroxidase, and a marked increase in catalase activity. During germination starch appeared in the growing embryo, and the moisture content of the seed decreased slightly. Seeds treated with concentrated sulfuric acid and stratified at 60° F. for 53 days showed a marked increase in catalase activity, suggesting rapid progress in afterripening.

Value of small-crowned ponderosa pines in reserve stands in the Southwest, F. H. WADSWORTH. (U. S. D. A.). (*Jour. Forestry, 40 (1942), No. 10, pp. 767-771, figs. 3*).—A study of the growth of 25 formerly suppressed ponderosa pines, located in an area on the Fort Valley Experimental Forest (Ariz.) which was logged for the first time in 1909, showed a marked effect of the release upon diameter increment. The 25 trees which ranged from 5 to 12 in. d. b. h. in 1909 were, after 30 yr., between 12 and 20 in. d. b. h. The growth increases in percentage were nearly the same for each of the three decades following cutting. The rapid growth of old, small-crowned trees following release led

to the following deductions: Ground space and position in the crown canopy greatly influenced diameter growth; and, within the limits encountered, there is little relationship between age or crown size and diameter growth. Apparently, any subordinate tree, regardless of age, whose bole has the making of a high-grade butt log and whose crown shows no sign of physiological decline is worth releasing.

The effect of openings in a young lodgepole pine forest on the storage and melting of snow, C. H. NIEDERHOF and E. G. DUNFORD. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 10, pp. 802-804, figs. 4).—Snow storage and the rate of melting were influenced by the size of crown openings between trees. Because of high losses from crown interceptions, small openings provided less snow for storage. Where prolonged melting is desirable in addition to maximum winter accumulation, crown openings between 16 and 17 ft. in size appeared optimum in the stands under study. Cuttings which provide a maximum number of shaded, sheltered openings in young lodgepole pine stands should result in optimum conditions for snow storage and slow melting.

Ice damage to slash pine, longleaf pine, and loblolly pine plantations in the Piedmont section of Georgia, A. D. McKELLAR. (Univ. Ga.). (*Jour. Forestry*, 40 (1942), No. 10, pp. 794-797, fig. 1).—Observations in a plantation of longleaf, slash, and loblolly pines near Athens, Ga., following a severe ice storm in January 1940 showed significantly greater damage to longleaf and slash pine than to loblolly pine. The final net loss resulting from broken stems, uprooted trees, and badly bent trees that failed to recover was 24 percent for longleaf, 29 for slash, and 4 for loblolly pine. The probable cause of the greater injury to the first two species was their denser and more persistent foliage, which accumulated a greater ice load.

DISEASES OF PLANTS

The Plant Disease Reporter, [November 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 26 (1942), Nos. 20, pp. 421-439; 21, pp. 441-468, figs. 2).—In addition to the host-parasite check list revision, by F. Weiss (No. 20, *Thuja* to *Tsuga*, and 21, *Turnera* to *Ungnadia*), the following are included:

No. 20.—Soybean diseases in Iowa in 1942, by I. E. Melhus; tobacco diseases in Virginia in 1942, by S. B. Fenne; diseases of bright tobacco in Pittsylvania County, Va., during the 1942 season, by W. A. Jenkins; and brief notes on the bad potato late blight situation in the Upper Mississippi Valley, beet scab in New York fields, a canker disease of *Crotalaria spectabilis* in Texas associated with *Sclerotium* [*Rhizoctonia*] *butaticola*, and bitter pit in McIntosh.

No. 21.—Fruit and vegetable diseases on the Chicago market in 1940 and 1941, by G. B. Ramsey; a single-virus streak disease of greenhouse tomatoes in Illinois, by M. B. Linn and H. W. Anderson; a latent virosis on Lombard plum in New York, by E. M. Hildebrand; prevalence of *Helminthosporium* leaf spot of oats in Arkansas in 1942, by H. R. Rosen; corn leaf blight (mostly *Helminthosporium turcicum*) very severe in Virginia, by S. B. Fenne; and *Fusarium moniliforme* ear rot in sweet corn, by P. E. Hoppe.

Bureau of plant pathology, D. G. MILBRATH (*Calif. Dept. Agr. Bul.*, 30 (1941), No. 4, pp. 374-384).—The work of 1941 is briefly summarized relative to control of white root rot (*Dematophora necatrix*) on alfalfa, chestnut blight, virus-induced western celery blight, peach mosaic, Pierce's disease of grape, bacterial wilt and virus dwarf of alfalfa, potato virus diseases, meadow nematode (*Pratylenchus pratensis*) on citrus, and alfalfa stem nematode (*Ditylenchus dipsaci*).

[Studies in plant pathology by the Georgia Coastal Plain Station]. (Partly coop. U. S. D. A. and Univ. Ga.). (*Georgia Coastal Plain Sta. Bul.* 32 (1941), pp. 83-86, 111-113, 122-128, 133-134, 135, figs. 2).—Brief notes are given on the progress of studies in relation to seed treatments, sprays, spore dissemination, physiological factors, and transportation as they affect the spread and development of early blight (*Alternaria solani*) on tomato seedlings; bacterial wilt (*Phylomonas solanacearum*) and the shipping of tomato plants; tests of chemicals and hot water as nematocides, effect of root knot on plants, resistant peach trees, and root knot and cover crops in peach orchards; flue-cured tobacco diseases (downy mildew, root knot, damping-off (*Rhizoctonia* and *Pythium*), and various other diseases), including control of downy mildew by sprays, gas treatment, and culture practices and root knot control in plant beds and tobacco fields; and shade tobacco diseases, including downy mildew control, avoidance of root knot in plant beds and control by rotations and culture practices, chemical treatment of soil in tobacco fields for disease control, irrigation, dates of planting, and breeding for resistance to black shank and root knot.

[Phytopathological studies by the Ohio Station] (*Ohio Sta. Bul.* 617 (1940), pp. 16-18, 19-23, 78-79, fig. 1).—Reports of progress are included on control of cherry leaf spot by fixed coppers and bordeaux; bordeaux and fixed copper sprays or dusts in control of vegetable diseases, including *Alternaria* and *Septoria* leaf spots of tomato, early blight of celery, carrot diseases, bacterial wilt of cucumbers, and leaf spots of lima and snap beans; dependence of fungicide flow on density; varying of copper deposits from fungicides; control of *Cercospora* leaf blight of sugar beets; outbreak of infection by new form of tomato leaf mold fungus (*Cladosporium*); control of *Verticillium* wilt of chrysanthemum; aster rust control by wettable sulfur; insoluble coppers for *Septoria* leaf blight of pompons; hot-water treatment failing to eliminate root knot on peony; development of corn hybrids resistant to various fungus diseases; bacteriophage sign of bacterial wilt resistance in corn; and progress in white pine blister rust control (coop. U. S. D. A. et al.).

[Work on plant diseases by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1941], pp. 26-27, 41-47).—Reports are given on progress relative to control of turf diseases, including brown patch, dollar spot, snow mold, and pink patch; vegetable seed treatment recommendations based on local trials; a "pre-cleanup" control for tomato root knot in greenhouses and the effect of chloropicrin soil treatment and fungicides on fruit production; apple scab development in 1941 and the relative values of fungicides for its control; survey of the apple black rot situation in 1941; seed and soil treatments for seed rot and root rots of sweet pea, and control of powdery mildew by fungicides and resistant varieties; response of bleeding cankered maples to chemotherapy and fertilization; rose black spot and powdery mildew control in commercial plantings; and a new aster disease, silver blight, of unknown cause.

Check list of diseases of economic plants in Canada, I. H. CROWELL, E. LAVALLÉE, ET AL. ([Ottawa]: Dominion Dept. Agr., 1942, pp. [1]+68).—This is a compilation of data on diseases of economic plants accumulated over many years in the literature and in the notes and records of many Canadian plant pathologists. An introductory statement in English and French is presented, and for each disease the English and French common names and the Canadian distribution are given. The arrangement is by scientific names of host plants and pathogens, and bacterial, fungal, and virus diseases are included. English and French indexes to the common names of hosts are provided.

Fungicides in relation to the national defense program, H. W. ANDERSON. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 75 (1941), pp. 168-173).

Developments with fungous diseases and fungicides during the past seventy-five years, H. C. YOUNG. (Ohio Expt. Sta.) (*Ohio State Hort. Soc. Proc.*, 75 (1942), pp. 125-135).—This is a brief review of progress in fruit disease control over a 75-yr. period, divided into three phases, viz, (1) the time before the discovery of fungicides, (2) that of the discovery of bordeaux and of other fungicides following in rapid succession, and (3) the modern period of rapid development in control measures and in detailed information concerning the parasites themselves.

A toximetric study of some eradicant fungicides, J. B. CARPENTER. (Wis. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 10, pp. 846-857, figs. 3).—The toxicities of four potential eradicant fungicides were studied in vitro by an agar-plate method described, six test fungi being used. Limited studies were made of the suppression by Elgetol of *Venturia inaequalis* ascospores in overwintered apple leaves. *Coccomyces hiemalis* was constantly one of the more susceptible test fungi, followed in order by either *V. inaequalis* or *Valsa cincta*. *Cladosporium carpophilum*, *Coryneum beijerinckii*, and *Sclerotinia fruticola* proved more resistant. The relative susceptibility of the fungi varied with each toxic preparation. Each isolate of a fungus species reacted quite uniformly in a series of tests, differences among them not being noteworthy. Under the conditions imposed, Lignasan proved most toxic, followed in order by a phenyl mercury oleate preparation, Elgetol, and a toluene derivative preparation. These materials usually killed at relatively low concentrations. Except Elgetol, each had a toxic vapor at the concentration used, an advantage to be considered in interpreting relative toxicities. Specificity of toxic action was clearly shown only by the toluene derivative. *Venturia inaequalis* w. s killed within 3 hr. by Lignasan and within 24-48 hr. by Elgetol at the highest concentrations used. *C. beijerinckii* proved more resistant, and *S. fruticola* was the most resistant to both fungicides. Although Elgetol killed more slowly than Lignasan, the apparent difference in rate becomes less important if the relation between the minimum lethal dose and the concentration used for each fungus and fungicide is considered. Five-tenths percent Elgetol at 600 gal. per acre usually suppressed more than 99 percent of the ascospores of *V. inaequalis* in naturally overwintered apple leaves. Suppression was as complete 3 hr. after treatment as later. In these tests it was possible to limit drastically the ascospore discharge from perithecia containing ripe spores. The importance of the time required for adequate suppression of the ascosporic inoculum of certain fungi is discussed. The results obtained give additional evidence that Elgetol is capable of rapid and drastic suppression for *V. inaequalis*. There are 29 references.

The composition and field performance of some silver sprays, L. W. NIELSEN and C. E. WILLIAMSON. (Cornell Univ. and U. S. D. A.). (*Phytopathology*, 32 (1942), No. 11, pp. 1026-1030).—In a field experiment there was no significant difference between silver-lauryl sulfate and bordeaux mixtures in controlling late blight (*Septoria apii*) of celery. The three silver sprays tested (composition and preparation given) were not so efficient as bordeaux against late blight of potatoes. Both the silver-lauryl sulfate and silver-manganous sulfate mixtures were as good as bordeaux against tulip "fire" (*Botrytis tulipae*) in one season's test. None of the silver sprays left an objectionable residue on the foliage. Judging from the tulip experiments, these sprays may be considered more promising as fungicides for certain plants that are susceptible to copper injury.

Chloropicrin as a disinfectant for plant beds, R. W. LEUKEL. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 11, pp. 1034-1036, fig. 1).—Chloropicrin soil disinfection effectively prevented "milo disease" of Colby milo in greenhouse and outdoor beds infested with *Pythium arrhenomanes*.

Fungicidal value of the salicylates, E. E. CLAYTON. (U. S. D. A.). (*Science*, 96 (1942), No. 2494, p. 366).—In the past 10-yr. search for sprays effective against tobacco downy mildew, the most promising results have been obtained with salicylates. The best so far tested is bismuth subsalicylate, followed by benzyl salicylate. Other materials showing promise are butoxyethyl salicylate, dinitrosalicylic acid, and salicyl salicylic acid.

The adherence of fixed copper fungicides as influenced by spray supplements, A. A. NIKITIN and E. G. ANDERSON (*Phytopathology*, 32 (1942), No. 11, pp. 953-964, figs. 5).—In studies of the performance of protein-containing supplements from the standpoint of their effects on the adherence and activation of basic copper sulfate, laboratory and field tests with soy and wheat flours, albumin, skim milk, and calcium caseinate indicated that according to protein content they exert a dissolving action on the fungicide. The soluble Cu released is sorbed by the protein to form a gelatinous sorption complex, which increases the adhesiveness of the spray deposit. A certain correlation was found to exist between the dissolving action of the supplement on the fungicide and the subsequent liberation of soluble Cu from the sorption complex.

A comment on Dr. Johnson's "Virus Nomenclature and Committees," F. O. HOLMES (*Chron. Bot.*, 7 (1942), No. 5, pp. 201-202).—A critique of the paper previously noted (E. S. R., 87, p. 530).

Recent evidence regarding the nature of viruses, T. E. RAWLINS. (Univ. Calif.). (*Science*, 96 (1942), No. 2497, pp. 425-426, figs. 2).—From references to the literature and statistical studies showing that virus particles of a given rod-shaped virus (strains of tobacco mosaic) have various lengths and that the longer lengths do not appear to be multiples of the most characteristic length, it is believed that viruses are not molecules. Length-width proportions are compared with those of bacteria.

The isolation and crystallization of plant viruses and other protein macro molecules by means of hydrophilic colloids, S. S. COHEN (*Jour. Biol. Chem.*, 144 (1942), No. 2, pp. 353-362, pl. 1, fig. 1).—The author describes the applications of this reaction in (1) crystallizing tobacco mosaic virus and its strains, tomato bushy stunt virus, and a snail hemocyanin, (2) separating two plant viruses, and (3) rapidly isolating crystalline tobacco mosaic virus from infectious juice. The tomato virus assumed a new crystalline form in the presence of heparin. Precipitation of the tobacco and tomato viruses by heparin at pH 7 did not seem to involve chemical combination. The effect of electrolytes and the charge of three colloids of similar structure on the precipitation of the tobacco virus was examined, and other properties of the colloids are considered in relation to its precipitation. There are 27 references.

An alignment chart for the computation of ultracentrifugation results, H. K. SCHACHMAN (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 395-402, figs. 2).—The chart constructed and here described proved accurate, convenient, and capable of effecting a considerable economy of time.

The germination of fungous spores in relation to controlled humidity, C. N. CLAYTON. (Univ. Wis.). (*Phytopathology*, 32 (1942), No. 11, pp. 921-943, figs. 8).—Using a method developed (and described) for accurately controlling high relative humidities for spore germination tests and with visible condensation precluded except to a limited degree at 100 percent, the following results were obtained: *Sclerotinia fructicola* conidia germinated well in redistilled water, but failed to germinate in 72-hr. tests on glass, paraffin, or quartz at relative humidities of 100 percent or below. It was demonstrated for the first time that ascospores and conidia of *Venturia inaequalis* could germinate on dry glass at 99-100 percent. The mean germination percentage of urediospores of *Puccinia coronata*, *P. graminis tritici* (race 56) and *P. graminis avenae* (race 2) on glass

was high in water, lower at a relative humidity of 100 percent, considerably lower at 99, and practically zero at 98. It was shown for the first time that chlamydospores of *Ustilago hordei* and *U. nuda* on dry glass or paraffin could germinate at 95-100 but not at 93 percent or below. Long basidial hyphae of *U. hordei* were produced at relative humidities of 100-95 percent, whereas sporidia were produced from basidia of spores germinating on water. *Erysiphe polygoni* conidia from red clover, cabbage, and evening primrose on dry glass germinated at 0-100 percent, but the germ tubes and survival time were very short at low relative humidities. There are 35 references.

Studies in the genus *Colletotrichum*.—I, Saltation in *Colletotrichum capsici* (Syd.), T. S. RAMAKRISHNAN (*Indian Acad. Sci. Proc.*, 13 (1941), No. 1, Sect. B, pp. 60-70, pl. 1).—A strain of *C. capsici* isolated from *Carthamus tinctorius* gave rise to six saltants, four of which, studied comparatively, exhibited differences in growth characters, size of acervuli, presence or absence of setae, sporulation, and pathogenicity. It is suggested that in creating new species of this genus pathogenicity alone should be given little prominence.

A new station for *Orobancha ludoviciana*, A. T. GUARD and W. H. SILVER (Purdue Univ.). (*Ind. Acad. Sci. Proc.*, 51 (1941), pp. 116-117, fig. 1).—In addition to *Ambrosia trifida* and *Nicotiana tabacum* as hosts of this angiospermic parasite, the authors report its occurrence in Indiana on *A. elatior*, *Lycopersicon peruvianum*, and *Xanthium* sp., believed to be new hosts.

Experiments toward the control of the take-all disease of wheat and the *Phymatotrichum* root rot of cotton, F. E. CLARK (*U. S. Dept. Agr., Tech. Bul.* 835 (1942), pp. 27, figs. 4).—In greenhouse experiments, organic materials giving excellent take-all (*Ophiobolus graminis*) control (e. g., chicken manure and alfalfa tops) markedly increased the nitrate-N and available-P content in soils, when applied at adequate rates. When partially composted and fresh or noncomposted manures were compared, only the latter appeared effective. When naturally infested soil in which wheat had been grown successfully under adequate fertilization was recropped to wheat under conditions favorable for *O. graminis*, failure of fertilization to eliminate the parasite was revealed but it was eradicated after maintenance for 3 mo. under moisture and temperature conditions favoring microbial activity and devoid of susceptible roots.

The activity of the saprophytic soil microflora appeared essential for destroying *P. omnivorum* sclerotia in artificially infested organic-amended soil. Under suitable incubation conditions, sclerotia were destroyed with either low- or high-N types of amendments. Increasing the organic material applied rendered non-viable greater percentages of sclerotia, and temperatures favoring general microbial activity were more destructive than low-temperature incubations. Attention was also given to the importance of favorable soil moisture and possibly also of aeration and soil reaction. Recovery of *P. omnivorum* was more difficult from parasitized roots that had been subjected to plant injury, and especially difficult from roots cut below the crown. From plants parasitized but not mechanically injured, *Penicillium* and *Trichoderma* spp., Dematiaceae, and sterile mycelium types were encountered with greater, and *Aspergillus* spp. and Mucorales with less relative frequency. Following infliction of mechanical injuries either above or below the crown, a similar shift in the fungus flora of nonparasitized roots and an accentuated shift in the flora of parasitized roots was evident.

Antibiotic effects are not necessarily the only contribution of organic amendments to soil sanitation. For take-all, antibiosis appeared of prime importance only in the absence of the host plant. For wheat-cropped soil, the fertility contributions of organic manures appeared responsible for observed reductions in take-all following manurial treatment. Evidence is considered sufficient that

a root-rotting parasite can be eliminated from soil devoid of susceptible roots. Activity of the saprophytic soil microflora appeared responsible for the marked destruction of *P. omnivorum* sclerotia in organic-amended soils, and competition for N did not appear to be the factor limiting its survival in manured soil. The development of agronomic procedures exploiting microbial antagonisms is believed to offer a practical line of attack against root-rotting parasites. There are 39 references.

The take-all disease of cereals, S. D. GARRETT (*Imp. Bur. Soil Sci. [Harpenden], Tech. Commun. 41 (1942), pp. [3]+40, pl. 1*).—This comprehensive outline of current knowledge (nearly three pages of references) on the disease due to *Ophiobolus graminis* considers early records, geographical distribution, economic importance, symptoms, and diagnosis of the disease; physiology, morphology, pathogenicity, and life cycle of the fungus; field observations and experiments on the prevalence of the disease and on its origin and dispersal; interpretation of some pot experiments; and a summary of control measures.

The downy mildew disease of oats, caused by *Sclerospora macrospora*, L. E. MILES and J. M. EPPS. (Miss. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 10, pp. 868–879, figs. 2).—This is believed to be the first record of *S. macrospora* on oats in the United States, as well as the first record of the disease in Mississippi. The symptoms on oats are described and compared with those on wheat. Affected oats plants are characterized by stiff, curled, and fleshy leaves, the rachis is usually short and twisted with few spikelets (mostly sterile), and many diseased plants fail to produce heads and apparently die early in the season. Spores are produced in all plant parts except the roots but are much more abundant in the leaves and glumes. The average diameter of 335 oospores from oats collected in Mississippi (1939–40) was 55.6 μ . There are 30 references.

Effective methods of inoculating seed barley with covered smut (*Ustilago hordei*), V. F. TAPKE and W. M. BEVER. (Idaho Expt. Sta. coop. U. S. D. A. and [N. Y.] Cornell Expt. Sta.). (*Phytopathology*, 32 (1942), No. 11, pp. 1015–1021, fig. 1).—The spore-suspension and vacuum methods of inoculating seed barley were devised and tested under field conditions in Idaho and New York, both proving far more effective than the well-known technic of inoculating seed by coating the surface with spores. By the two new methods (1) the seed is first treated for 1 hr. with formaldehyde solution, then washed in water and dried, which eliminates superficially foreign inoculum, loosens the hulls around the caryopsis, and materially increases the effectiveness of inoculation; (2) the seed is covered with spores in suspension, spores thus being carried beneath the hulls and coming to lie close to the point of attack; and (3) inoculated seed is then stored 16–20 hr. while still moist, thus promoting spore germination and spread of inoculum before the seed is dried and sown. The vacuum method has been slightly superior in smut production, but with large-scale inoculations, particularly in studies of physiologic races, the spore-suspension method appears to be easier and safer to apply.

Brown necrosis and *Alternaria* blotch of wheat, T. JOHNSON and W. A. F. HAGBORG (*Sci. Agr.*, 22 (1942), No. 12, pp. 746–760, fig. 1).—*Puccinia graminis tritici* and *A. tenuis* were proved capable of inducing melanistic discolorations on certain rust-resistant wheats derived from crosses with Hope and II-44. Stem rust induced on the outer glumes the “brown necrosis” described by McFadden (*E. S. R.*, 81, p. 659), resembling bacterial black chaff and with similar symptoms on lemma tips, rachides, peduncles, and on the internodes immediately below the nodes. Rust infection produced discoloration most readily in the first few days after heading. Penetration of entrance hyphae into the substomatal cavities was found, but no further development.

A. tenuis caused on the lemmas a grayish-brown discoloration resulting from

growth of the fungus within the florets. Mycelial growth commonly occurred on unextruded anthers but frequently also involved the ovary, in which case the floret was sterile and the whole lemma discolored. Lemma discoloration was apparently associated with floret sterility. Cultures isolated from diseased florets have failed to produce floret sterility in the greenhouse but in some of the field tests have caused a significant increase in sterility. In discolored lemmas there was abundant mycelial growth along their inner surfaces but very rarely any penetration. The discoloration is possibly due to excreted toxic substances from the fungus growth within the floret.

Scab of wheat and barley and its control, J. G. DICKSON. (Coop. Wis. Expt. Sta.). (U. S. Dept. Agr., *Farmers' Bul.* 1599, rev. (1942), pp. II+22, figs. 19).—Information on the disease and its cause, *Gibberella saubinetii*, including occurrence, losses, use of scabbed grain for feed, environal factors, and control, is given in this revision (E. S. R., 62, p. 236).

Observations on antagonism in inoculation tests of wheat with *Helminthosporium sativum* P. K. & B., and *Fusarium culmorum* (W. G. Sm.) Sacc., R. J. LEDINGHAM (*Sci. Agr.*, 22 (1942), No. 11, pp. 688-697).—In inoculation tests by the author and others, each of these root rot fungi used alone almost invariably caused a reduction in emergence and frequently in yield of wheat. On the other hand, in the tests here reported where the two pathogens were mixed, the injury as reflected in emergence and sometimes in yield as well was noticeably less, indicating antagonism. It was further shown that this antagonism was more marked where the oats-hull method of inoculation was used. In laboratory tests the germination of *H. sativum* conidia was reduced by the presence of *F. culmorum* conidia. There are 21 references.

Varietal resistance of alfalfa and sweet clover to root- and crown-rotting fungi in Alberta, M. W. CORMACK (*Sci. Agr.*, 22 (1942), No. 12, pp. 775-786).—On the basis of present information, including the results of this study, the pathogens of alfalfa and sweetclover attacking in early spring are, in their order of destructiveness, *Cylindrocarpon ehrenbergii*, *Sclerotinia sativa*, and *Fusarium avenaceum*. Similarly, those attacking growing plants of sweetclover are *Phytophthora cactorum*, *F. culmorum*, *F. avenaceum*, and *S. sativa*. Alfalfa was markedly more resistant than sweetclover to all these fungi, except the undetermined low-temperature basidiomycete from Alberta and Saskatchewan. Of the varieties tested for resistance to *C. ehrenbergii* and *S. sativa*, *Medicago falcata* stood highest, and Cossack and Viking ranked somewhat below it but probably only slightly above the other varieties, which included Grimm. Some resistance to the basidiomycete was probably indicated in the first three varieties, but present indications are that all sweetclover varieties are highly susceptible to it. Of the sweetclovers tested for resistance to *S. sativa*, varieties of *Medicago alba* were more susceptible than those of *M. officinalis*. Redfield Yellow (*M. suaveolens*) was only slightly less susceptible than varieties of *M. alba*. This variety and Arctic (*M. alba*) were the only ones appearing to possess some resistance to *C. ehrenbergii*, and inconclusive results were obtained with *F. avenaceum*. A strain of Alpha sweetclover (developed at Saskatoon) proved "quite resistant" to *P. cactorum*, the original Alpha variety was moderately susceptible, and Arctic and all other varieties tested were highly susceptible.

Relative concentrations of two strains of curly-top virus in tissues of susceptible and resistant beans, C. F. LACKEY. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 10, pp. 911-913).—The two virus strains 1 (virulent) and 4 (much less so) were used to infect the two bean varieties Great Northern U. I. 81 (resistant) and Bountiful (extremely susceptible). Nonviruliferous leafhoppers were fed on 5-percent sucrose solutions in which 20 root tips of each variety were macerated for each test. These vectors were then caged singly on

susceptible sugar beet seedlings or shoot tips. Virus strain 1 from the susceptible bean variety produced much more infection than when taken from the resistant variety. Strain 1 from the susceptible bean consistently produced a much higher percentage of infection than did the less virulent virus strain 4. Virus strain 1 in the resistant bean appeared to be promptly inactivated or its multiplication quickly inhibited. The reactions of virus strain 1 in the resistant and strain 4 in the susceptible bean are in direct contrast to their reaction in resistant and susceptible sugar beets.

Fusarium yellows of beans, J. B. KENDRICK and W. C. SNYDER. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 11, pp. 1010-1014).—A vascular *Fusarium* disease of field beans characterized by gradual yellowing of the leaves from the base upward, dwarfing, eventual dropping of the leaves, and final death of the plant is reported to have been present in the Sacramento Valley, Calif., since 1929. A form resembling the cowpea wilt organism (*F. oxysporum* f. *tracheiphilum*) in culture was consistently isolated from diseased tissues, but inoculations indicated it to be pathogenic only to varieties of common beans and not to lima beans, cowpeas, or soybeans. The causal agent of bean yellows is thus apparently an undescribed form of *Fusarium* and is designated as *F. oxysporum* f. *phascoli* n. f. The pathogen is often transmitted with the seed and can be controlled by seed treatment with Semesan or Ceresan.

Effect of diseases upon survival of white clover, *Trifolium repens* L., in Alabama, H. R. ALBRECHT. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 8, pp. 725-730, figs. 3).—Studies of white clover diseases in pastures and strain tests at several Alabama locations suggested diseases as responsible for much of the failure of this crop during summer. Thus far, 10 diseases have been recognized, of which southern blight (*Sclerotium rolfsii*) has proved the most destructive to date. Leaf spots (*Stagonospora mcliloti* and *Cercospora* sp.) and root knot (*Heterodera marioni*) were also highly destructive to white clover in pastures. The tests indicated that some degree of resistance to most of the diseases occurs. Diseases became most destructive after mid-June, when the main seed crop had matured. In overgrazed or sparsely vegetated pastures, white clover was not generally severely attacked by disease. Only in pastures characterized by heavy growth were diseases found abundantly, the only exceptions being root knot and *Cercospora* leaf spot, which occurred usually in late summer. The observations suggested that disease prevalence may actually have resulted from good pasture management. Heavy growths of winter weeds became established on all plats at Auburn which had suffered extensive stand reductions due to diseases.

Biological technique for the evaluation of fungicides.—II, The evaluation of seed disinfectants for the control of seed-borne diseases of flax, A. E. MUSKERT and J. COLHOUN (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 22, pp. 219-227).—In continuation,* an account is given of field and laboratory methods devised for evaluating seed disinfectants for use against seed-borne flax diseases, *Polyspora lini* (stem break and browning) and *Colletotrichum lini* (seedling blight) being especially considered. The laboratory procedure, based on the Ulster method for examining seed samples for seed-borne parasites, can be completed within 7 days at any time of year. Statistical analysis of the results indicated a high correlation between the two tests. Thus the laboratory method may be regarded as reliable and accurate.

Potash deficiency symptoms in Napiergrass, *Pennisetum purpureum*, G. W. BURTON and C. L. LEFEBVRE. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 372-375, figs. 2).—A reasonably dependable index of K starvation in Napier grass consists in the

* *Ann. Bot. [London]*, n. ser., 2 (1938), No. 7, pp. 699-715, pl. 1.

formation of irregular brown spotting and sometimes "firing" of the tips and margins of the leaves. Probably because of its tremendous leaf production, this grass has a high K requirement and must be supplied with rather large amounts if the loss of leaves from K deficiency is to be avoided. That this species is an unusually strong feeder for K is indicated by the severe K-deficiency symptoms developed by velvetbeans following it in rotation. Very leafy strains of Napier grass developed K-deficiency symptoms earlier and to a greater degree than the less leafy types.

Nomina de las enfermedades y pestes de la papa cuya existencia se ha comprobado en el pais [List of diseases and pests of the potato known to be present in Chile], F. MUJICA R. (*Bol. Sanid. Veg. [Chile]*, 1 (1941), No. 1, pp. 70-72).—Virus, bacterial, and fungus diseases and animal parasites (insects and nematodes) are included.

La "alternariosis" de la patata [Early blight of potato], L. RODRIGUEZ LZ (*Bol. Inst. Bot., Univ. Cent. Ecuador*, 1 (1942), No. 1, pp. 85-124, figs. 7).—This is a general account of early blight (*Alternaria solani*) of potato, with particular reference to the Sierra provinces of Ecuador. There are 26 references.

Apical leaf speck of potatoes, G. B. SANFORD (*Sci. Agr.*, 22 (1942), No. 12, pp. 772-774, fig. 1).—A malady apparently due to certain soil factors favoring faulty nutrition of the plant is briefly described and named "apical leaf speck." Numerous small black dots on the apical leaves, local necrotic areas in the pith of the upper half of the stem, and the absence of internal necrosis in the tubers or break-down during storage appear to distinguish it from internal rust spot and sprain.

La "anguilulosis" de las papas [Root knot of potato], L. RODRIGUEZ LZ (*Bol. Inst., Bot., Univ. Cent. Ecuador*, 1 (1942), No. 1, pp. 160-168, figs. 4).—A general account on *Heterodera radiculicola* on potato and its control.

Potato scab gardens in the United States, F. J. STEVENSON, L. A. SCHAAAL, C. F. CLARK, R. V. AKELEY, ET AL. (U. S. D. A. and Expt. Stas.). (*Phytopathology*, 32 (1942), No. 11, pp. 965-971).—The 22 potato varieties tested in 4 potato-scab gardens exhibited highly significant differences in reaction to *Actinomyces scabiei* for pustule-type and tuber-surface coverage. The pustule type and percentage of tuber surface covered with pustules were highly correlated, indicating that in the majority of cases the relative varietal reactions to infection could be estimated by either criteria. In general, the varietal reactions were quite constant over the 2 yr. and four places involved, with the highly resistant varieties showing less tendency to vary between years or among places than the slightly resistant or susceptible. Interactions between variety and place were significant and could be due to environal factors or physiological forms or to both. The highly significant interaction for pustule type between place and year indicated the influence of environment rather than of physiologic form. From the breeding standpoint it would appear possible to select varieties highly resistant to scab in Maine that would perform similarly elsewhere, but before generalized statements are made they should be tested under a wide range of environal conditions.

Effect of environment on the prevalence of soil-borne Rhizoctonia, O. H. ELMER. (Kans. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 11, pp. 972-977, fig. 1).—Wide differences were noted in the prevalence of soil-borne *Rhizoctonia* (*Corticium vagum*) in Kansas potato fields during the 13 yr. under study. It survived in the soil only in those years when there was enough summer rainfall to prevent desiccation and death of the fungus in its mycelial stage. Sclerotia were absent during the critical summer months, because their formation requires cooler weather than usually occurs in Kansas during July and August. The

organism can persist parasitically on infected host plants during summers when the soil is so dry that it cannot survive saprophytically.

An unknown potato disease (possibly virus in nature) (*N. J. State Potato Assoc., Hints to Potato Growers*, 23 (1942), No. 4, p. [4]).—Because of the urgency of determining the nature, destructiveness, and control of this new disease observed on the Sequoia, Houma, Sebago, Katahdin, Chippewa, and Cobbler varieties near Vincentown, N. J., the symptoms are summarized. Among them are a shortening of the internodes and reduction of the angle between petiole and stem, a mild thickening of the main stem of the plant, and premature activity of many normally dormant buds.

Belworm disease of potatoes, A. HOWARD (*Gard. Chron.*, 3. ser., 111 (1942), No. 2890, p. 207).

Susceptibility of *Solanum* species to *Fusarium solani* var. *eumartii*, R. W. GOSS and J. H. JENSEN. (*Nebr. Expt. Sta.*). (*Phytopathology*, 32 (1942), No. 10, p. 914).—*Solanum* sp. from Chile, P. I. 129381, *S. acule*, *S. demissum*, *S. chacoense*, *S. commersonii*, and *S. antiporiczii* proved susceptible on soil inoculation.

Pathology, J. P. MARTIN (*Hawaii. Sugar Planters' Assoc. Ptd. Rpts.*, 61 (1941), *Expt. Sta. Com. Rpt.*, pp. 28–42).—This report presents a brief summary of work by the pathology department, including, besides routine matters, studies of “foreign” sugarcane diseases and of diseases present in Hawaii (brown stripe, chemical and mechanical injuries, chlorotic streak, lightning injury, eyespot, leaf scald, malgrowths, pokkah boeng, root rots, and physiological disorders).

Internal breakdown of sweet potatoes due to exposure to cold, W. D. KIMBROUGH and M. F. BELL (*Louisiana Sta. Bul.* 354 (1942), pp. 9, figs. 2).—It is concluded from the experimental evidence presented that sweetpotatoes are injured by exposure to cold temperatures above the freezing point and that the effects may not become readily apparent for some time afterwards. Where the roots are severely injured very little latex or none will appear on the cut surface, which also has an abnormal appearance. A temperature of 40° F. for 1 week proved injurious, and the indications are that pinkiness appearing later in the storage season may be at least partly due to slight exposure to cold. Control of the minimum temperature in storage thus becomes highly important, and 50° should be the lower limit. During some winters in southern Louisiana little or no artificial heating may be necessary, but in others it becomes imperative if the roots are to be kept successfully.

Control of blue mold of tobacco by a new spray, P. J. ANDERSON. (*Conn. [New Haven] Expt. Sta.*). (*Science*, 96 (1942), No. 2496, p. 409).—Sensing a definite need for a simple, safe, inexpensive but effective spray or dust for control of *Peronospora tabacina* in the beds a long list of chemicals were tested, among which one, ferric dimethyl dithiocarbamate (trade name “Fermate”), appears to fill the requirements, as based on the experimental results during one winter in the greenhouse and one spring in the seedbeds. The most successful dosage was 1.5–2 gm. in 1 liter of water, with an equal amount of lime added. With 100 percent infection the rule among controls, 95–100 percent of the sprayed plants were disease-free. Before drawing final conclusions, however, it is believed this treatment should be repeated over several seasons and by practical growers in different sections.

The molecular size and shape of the nucleic acid of tobacco mosaic virus, S. S. COHEN and W. M. STANLEY (*Jour. Biol. Chem.*, 144 (1942), No. 3, pp. 589–598, fig. 1).—Data are presented on the electrophoresis, partial specific volume, diffusion, sedimentation, viscosity, electron microscopy, osmotic pressure, optical properties, and elementary composition of protein-free ribonucleic acid and its derivatives, isolated from heat-denatured tobacco mosaic virus. Freshly isolated nucleic acid had an average particle weight of 300,000 and was highly

asymmetric. It decomposed spontaneously to form asymmetric particles with a molecular weight of about 61,000. Both these molecules appeared to be too long to lie within the width of 150 a. u. of the virus molecule. These materials may be converted with cold alkali to particles with a molecular weight of 15,000 and an axial ratio of 10. Problems of virus structure and properties of ribose- and desoxyribosenucleic acid are discussed. There are 39 references.

The fractionation of the amino acids of tobacco mosaic virus protein, A. F. ROSS. (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 685-693).—Of the amino acids previously reported in this virus protein, arginine, phenylalanine, tyrosine, and proline were isolated from its hydrolysates and, as expected, the amounts actually isolated were less than those previously found. In addition, the presence of at least 5.3 percent glutamic acid, 2.6 aspartic acid, 6.1 leucine, 3.9 valine, and 2.4 percent alanine was established by isolation procedures. This brings the known constituents of tobacco mosaic virus to about 68 percent of the total. There are 31 references.

A comparison of the alkaline cleavage products of two strains of tobacco mosaic virus, C. A. KNIGHT and M. A. LAUFFER (*Jour. Biol. Chem.*, 144 (1942), No. 2, pp. 411-417).—Nucleic acid was removed by alkali from common and ribgrass strains of tobacco mosaic virus, and the nucleic acid-free protein components were examined in the Tiselius electrophoresis apparatus, analytical ultracentrifuge, and electron microscope. Although it was shown that the protein components differ in amino acid composition, a mixture of the proteins at pH 7.1 and pH 10 migrated in an electrical field as though composed of a single component. From these results it is concluded that the electrophoretic technic cannot be depended on to distinguish between biologically related but chemically different proteins. Under certain conditions sedimentation constants were obtained, and thus estimates of the average size of the protein particles in several preparations could be made. The smallest and largest materials represented by different preparations corresponded to molecular weights of 5×10^4 and 7×10^6 . Electron micrographs of the proteins showed particles of many sizes, some corresponding to those calculated from sedimentation data.

The concentration and purification of tobacco mosaic virus by means of the Sharples super-centrifuge, W. M. STANLEY (*Jour. Amer. Chem. Soc.*, 64 (1942), No. 8, pp. 1804-1806).—This apparatus, equipped with a regular clarifier bowl operating at 50,000 r. p. m. by compressed air proved satisfactory. It was found advantageous to use a cooling coil, a celluloid and a filter paper liner in the bowl, and a modified delivery jet constructed from a small hypodermic needle. Using the clarified juice from mosaicked Turkish tobacco plants as starting material, it was possible to prepare 10-15 gm. of virus sufficiently pure for most purposes in 10 hours' time.

The effect of mosaic virus infection on the protein content of susceptible and resistant strains of tobacco, C. H. HILLS and H. H. MCKINNEY. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 10, pp. 858-867).—Virus infection caused a marked increase in the total-N content of susceptible tobacco (Wisconsin-Havana Seed) grown under conditions of low-, medium-, and high-N nutrition. Grown under a reduced-N supply, the resistant tobacco (T. I. 448A) showed a decrease in total N in the virus-infected plants, but when grown with a more adequate N supply no decrease in total-N content was found. Mosaicked leaves of the susceptible tobacco contained 30 percent less chlorophyll and had a lower chlorophyllase activity than healthy leaves, but there was no change in the chlorophyll or chlorophyllase of infected leaves of T. I. 448A. The oxidase activity of both resistant and susceptible strains was decreased by the virus, and, while the changes in enzyme activities caused by the infection were slightly

less in the resistant than in the susceptible variety, it is evident that a very small amount of virus nucleoprotein was sufficient to produce measurable alterations in the metabolism of the resistant tobacco. There are 17 references.

The preparation and use of tobacco mosaic virus containing radioactive phosphorus. W. M. STANLEY (*Jour. Gen. Physiol.*, 25 (1942), No. 6, pp. 881-890, pls. 2).—Normal and mosaic Turkish tobacco plants were grown in sand for several weeks while fed daily a complete nutrient solution plus disodium phosphate containing radioactive P. Determinations were made of the distribution of radioactive P in different fractions such as the wash from the sand and roots, the press cake obtained on pressing the juice from the plants, the protein and protein-free portions of the supernatant liquids obtained on ultracentrifugation of the juices, and the purified virus. Chemical analyses as well as radiographs of the normal and diseased leaves indicated them to contain the same amount of P. Approximately 30 percent of the radioactive P absorbed by the diseased plants was combined with the purified virus isolated therefrom. Following inoculation of purified virus of high radioactivity to normal plants, most of the radioactivity was associated with nonvirus components of which about 40 percent was in the inoculated and 60 percent in the uninoculated portions. Although a small amount of radioactive virus was isolated from the uninoculated portions of the plants, it was impossible, because of complicating factors (discussed), to draw from the results any reliable conclusions regarding the mode of reproduction of this virus.

Control of the common mosaic disease of tobacco by breeding. W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 11, pp. 1022-1025).—Though it has been known for 15 yr. that common mosaic of tobacco can be controlled successfully if the hands of workers are freed of virus before weeding and pulling plants (E. S. R., 60, p. 54), growers have not always been successful in controlling hired help. The development of resistant varieties thus becomes especially to be desired. From his own experimental evidence, here briefly summarized, the author believes it safe to conclude that both the Ambalema (A) and the glutinosa (N) types of resistance, either singly or together, will prove satisfactory for practical control of tobacco mosaic if satisfactory commercial varieties containing these factors in a homozygous condition can be produced.

Vegetable disease studies. C. DORMAN (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 10, p. 6).—Brief progress reports are included with respect to the relation of soil fertility to wilt in tomatoes and the development of resistant varieties, early blight (*Alternaria*) susceptibility increased by wilt infection and its fungicidal control, cabbage seed treatment and seedbed fumigation against damping-off, and seed treatments of garden pea, spinach, and lettuce.

The reaction of cantaloupe strains to powdery mildew. D. E. PRYOR and T. W. WHITAKER. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 11, pp. 995-1004, fig. 1).—Cantaloup strains differing in resistance were inoculated in the greenhouse with *Erysiphe cichoracearum* (race 2) and the symptoms noted. Duplicate plantings of 18 cantaloup strains were made in the greenhouse and at three different dates in field plots, comprising selections from Hale Best (susceptible to mildew races 1 and 2), Powdery Mildew Resistant Cantaloupe No. 45 (resistant to race 1 but not to race 2), several strains believed tolerant to both races, and a strain highly resistant to both. In the greenhouse all strains (except the last) were very severely attacked. The majority of the tolerant strains were significantly better than No. 45 in the first field planting, several were superior in the second, and all lines except the highly resistant one were very badly diseased in the third. Data from individual-plant reactions in the greenhouse and from the same plants after setting in the field indicated the

greenhouse method to be much more reliable than field trials for selecting highly resistant plants, provided all macroscopic leaf and stem symptoms are taken into account.

The influence of vitamin B₁ on the development of cantaloupe powdery mildew. D. E. PRYOR. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 10, pp. 886-896, fig. 1).—When various concentrations of this vitamin were added to soil in which cantaloup varieties resistant and susceptible to race 2 of *Erysiphe cichoraccarum* were growing, the average number of fungus colonies on the susceptible variety was 1.3-1.5 times that of the control, and the amount of necrosis on the resistant one was 2.1-2.8 times that of the control. When healthy leaves of the susceptible variety were excised, inoculated, and maintained on a sucrose solution to which various amounts of thiamin were added, there was no significant effect on mildew development as compared with the control, but there was a tendency toward increased mycelial development with the lower thiamin concentrations. Thiamin solution applied to soil supporting mildew-free plants of the susceptible variety from which leaves were finally excised, inoculated, and maintained on a sucrose solution significantly increased mildew growth at 0.01 p. p. m., but higher concentrations were without significant effects. Various concentrations of thiamin added to soil had no significant effects on the green weight or height of cantaloup tops.

Control of fungi in mushroom casing soil by sterilization with chloropicrin. A. M. KLIGMAN (*Phytopathology*, 32 (1942), No. 11, pp. 978-985, fig. 1).—Chloropicrin (2 cc. to 1 cu. ft. of soil) was found to kill spores of *Mycogone perniciosa*, *Verticillium malthousei*, and *Dactylium dendroides*, and a method is described by which sufficient soil for a standard house (contained in a bin 9 by 11.5 by 3 ft.) can be sterilized with 3 cc. to 1 cu. ft. Direct field sterilization was accomplished by covering the treated area with canvas. The yield of chloropicrin-treated soil was comparable to formaldehyde- and steam-treated soils.

The value of Spergon as a seed protectant for canning peas. E. G. SHARVELLE, H. C. YOUNG, JR., and R. F. SHEMA. (Minn. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 11, pp. 944-952, figs. 4).—Seed treatment with Spergon in 1940 resulted in an average increase in stand of plants amounting to 23 percent, New Improved Ceresan in one case gave the same increase, while nitrogen inoculation gave an increase in stand of 10 percent over the untreated plot. The increases in total vine length obtained in 1941 were statistically insignificant; those in 1940 were not. Root development on plants from seeds treated with Spergon appeared to be stimulated materially, and the incidence of root rot was greatly reduced. Increased yields of 300-800 lb. of green shelled peas to the acre were obtained at three locations by treating seed with Spergon, the average increase amounting to 357 lb., or 18 percent, over controls in 1940. Pea root rots were present in epidemic proportions in the locations involved during both years. Results obtained in 1941 substantiated the findings of 1910.

Fusarium wilt of radish. J. B. KENDRICK and W. C. SNYDER. (Univ. Calif.). (*Phytopathology*, 32 (1942), No. 11, pp. 1031-1033).—A vascular *Fusarium* wilt of White Chinese Winter radish (*Raphanus sativus longipinnatus*) characterized by symptoms resembling those of cabbage yellows due to *F. oëysporum* f. *conglutinans* occurred in a seed field in California (1934). The fungus was shown to be pathogenic also to common radishes, but to be distinct from the cabbage yellows *Fusarium*. It is here described as *F. oëysporum* f. *raphani* n. f.

Control of bacterial canker of tomatoes. H. L. BROWD. (U. S. D. A. and Utah Expt. Sta.). (*Canning Age*, 23 (1942), No. 4, pp. 221-223, figs. 2).—A general summary on the disease due to *Phytomonas michiganensis* and its control.

Collar rot resistance in tomatoes. C. F. ANDREWS, G. B. REYNARD, H. JOHNSON.

SEN, and J. EADES. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 7, pp. 339-346, figs. 2).—Using a method (described) of dipping foliage of 4-week-old tomato seedlings in a water suspension of macerated *Alternaria solani* culture at the time of transplanting, 100 percent collar rot was produced on the most susceptible varieties and 100 percent freedom from it on the most resistant. In this way a large number of standard varieties and clonal selections were rated according to collar rot reactions, complete resistance apparently occurring in 23 varieties and accessions. This resistance is correlated with lesser degrees of susceptibility to *Alternaria* leaf spot. The method of determining collar rot resistance should facilitate the breeding of tomatoes resistant to defoliation.

A new strain of the tomato leaf mold fungus (*Cladosporium fulvum*), L. J. ALEXANDER. (Ohio Expt. Sta.). (*Phytopathology*, 32 (1942), No. 10, pp. 902-905, fig. 1).—Leaf-mold lesions were observed on the second crop after introduction of the resistant tomato variety Globelle, and observations indicated the presence of a new strain of the fungus. In cross-inoculation tests, Globe and three other standard varieties were used as susceptible, and the resistant parent *Lycopersicon pimpinellifolium* and the three resistant varieties (Globelle, Bay State, and Veto-mold) developed from it as resistant varieties. All plants of the standard varieties proved susceptible alike to both strains of the fungus. All plants of the resistant varieties were highly resistant or immune to the Globe strain of the fungus, but were all susceptible to the Globelle strain. Observational evidence indicated Globelle to be less susceptible than standard varieties such as Globe. *C. fulvum* is not limited in its parasitism to the one host species *L. esculentum*.

A strain of tobacco-mosaic virus causing a necrosis and shriveling of tomato foliage, S. P. DOOLITTLE and F. S. BEECHER. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 11, pp. 986-994, figs. 2).—Greenhouse tomatoes in the vicinity of Washington, D. C., at times have been affected by a virus causing reddish-brown leaflet necrosis followed by gradual shriveling of the older foliage, but without symptoms on stems or fruit. As far as determined, its physical properties and host range are the same as those of ordinary tobacco mosaic, and the symptoms are the same on tobacco and on nearly all other hosts tested. Serological tests also indicated a relationship. On *Nicotiana glauca*, where the tomato virus produces lesions like those of aucuba mosaic, previous infection by tobacco mosaic virus protects against infection by the virus from tomato. Since all comparative evidence indicates that the virus causing leaf-shriveling of tomato is a strain of the tobacco mosaic virus, it has been classified as *Marmor tabaci siccans* n. var. Seed transmission has occurred in tomato seedlings grown from freshly extracted seed of infected fruits, but no such transmission has been noted from seed dried for more than 10 days. The virus has appeared sporadically in the greenhouse for several years, but the sources of primary infection remain in doubt.

Apple blotch, F. M. ROLFS (*Oklahoma Sta. Bul.* 261 (1942), pp. 15, figs. 4).—Pertinent data are presented on the history, host plants, symptoms, cause (*Phyllosticta solitaria*), dissemination, and control. There are 13 references.

Eradicant sprays for apple blotch, H. W. ANDERSON and D. POWELL. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 75 (1941), pp. 391-400).—On the basis of the one season's experiments (1941) reported, it is believed that blotch control cannot be expected by use of an eradicant spray, such as Elgetol, without supplementary summer sprays. Since the efficiency of Elgetol depends on the advanced stage of pycnidial development, it is necessary to time the application just previous to the opening of the buds. From a practical standpoint, it is believed doubtful if expensive eradicant sprays would pay unless they served other purposes. For

example, Elgetol is effective in killing aphid eggs and an application at this stage would effectively clean up that pest.

Studies of crown rot of apple trees, M. F. WELSH (*Canad. Jour. Res.*, 20 (1942), No. 9, Sect. C, pp. 457-490, pls. 3, fig. 1).—The form of crown rot occurring in irrigated orchards of British Columbia is confined to the below-ground bark tissues and has been encountered in trees of all ages and of all commercial varieties grown there. Definite proof of the causal relation of *Phytophthora cactorum* is presented. Isolation has been possible only from the margins of active lesions, and there is evidence that the fungus is inhibited in rotted tissues by the antagonistic effects of one or more secondary organisms. The effects of soil moisture and temperature on the disease seem to be interrelated, with the highest incidence in an almost saturated soil and at the highest temperature (32° C.) imposed. The influence of soil moisture is exerted particularly in the subsoil rather than in the locus of attack. Certain apple varieties were found to differ in resistance. Deep wounds have proved necessary for bark invasion.

Moldy core of apples in Wisconsin, J. B. CARPENTER. (Univ. Wis.). (*Phytopathology*, 32 (1942), No. 10, pp. 897-901, fig. 1).—The symptoms in the Dudley and Delicious varieties are given for this disorder, which is of minor economic importance but occurs in a high proportion of the fruit of these varieties in Wisconsin. Size of fruit seemed to have no influence on the incidence of the trouble, but undesirable morphological fruit characters in these two varieties predispose them to infection. A fungus of the *Alternaria tenuis* group predominated, but species of other genera were found either alone or associated with it. Inasmuch as several fungus species were found growing in the calyx basin on dead floral remnants, it seems that *Alternaria* sp. may be peculiarly adapted for entering the core and establishing itself.

Some factors influencing the epidemiology of apple scab, D. POWELL and H. W. ANDERSON. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 75 (1941), pp. 278-288, figs. 2).—From the observations reported, including the influence of climatic conditions and the effect of insecticides on primary inoculum, it appears probable that a spore may be carried many miles, by chance lodge on the correct host, and, with moisture relationships conducive to development, cause infection. However, the greater number of spores were found to infect within the immediate vicinity of the point of discharge.

The use of cradicant sprays for the control of apple scab in Illinois, 1941 results, D. POWELL and H. W. ANDERSON. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 75 (1941), pp. 195-212, figs. 3).

Developments in peach virus disease investigations, H. H. THORNBERRY. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 75 (1941), pp. 326-343, figs. 9).—"The purpose of this paper is to bring to attention recent developments in research and control measures pertaining to peach viruses and to report the work in progress in Illinois."

A progress report on western X-disease, a virus disease of peaches, E. L. REEVES and L. M. HUTCHINS. (U. S. D. A.). (*Wash. State Hort. Assoc. Proc.*, 37 (1941), pp. 27-30).

Russet and protuberances on prune fruit in 1941, E. E. WILSON. (Univ. Calif.). (*Calif. Dept. Agr. Bul.*, 30 (1941), No. 3, pp. 282-285, figs. 2).

La antracnosis de la vid [Grape anthracnose], S. J. TARTAKOWSKY H. and S. T. ARENTSEN S. (*Bol. Sanid. Veg. [Chile]*, 1 (1941), No. 1, pp. 7-18).—The authors discuss the geographical distribution of the disease due to *Elsinoe ampelina*, the conditions favoring its development, estimated damage caused in different parts of Chile, and methods of control.

Anthrancosis de la vid en Chile [Grape anthracnose in Chile], A. E. JENKINS and A. A. BITANCOURT. (U. S. D. A. et al.). (*Bol. Sanid. Veg. [Chile]*,

1 (1941), No. 1, pp. 19-53, figs. 3).—The authors present a detailed discussion of the history of grape anthracnose in Chile beginning with the early study of the disease in 1874 and its definite diagnosis in 1876, including the original description of the disease and its cause by R. F. Lefevre, together with other pertinent landmarks in its early history and the taxonomy of the causal fungus *Elstonia ampelina*. There are 46 references.

La lepra explosiva del naranjo [Orange leprosis], M. J. FREZZI (8. *Amer. Sci. Cong., Washington, 1940, Proc., vol. 5, pp. 239-241*).—It is concluded from evidence presented that this disease is due to a virus transmitted by mites (acaros).

Yeasts occurring on dates, E. M. MRAK, H. J. PHAFF, and R. H. VAUGHN. (Univ. Calif.). (*Jour. Bact.*, 43 (1942), No. 6, pp. 689-700).—From California and Egyptian dates undergoing microbiological deterioration 67 yeast cultures were isolated, most of them being referable to *Zygosaccharomyces*, *Hanseniaspora*, or *Candida*. Other perfect genera obtained were *Saccharomyces*, *Pichia*, and *Hansenula*. In the genus *Torulopsis* (three cultures), *T. dactylifera* n. sp. is described. Detailed identities are presented, and the sugar tolerance of all yeasts isolated is compared. All cultures of *Zygosaccharomyces* were more sugar-tolerant than the other yeasts isolated. There are 28 references.

Structural and chemical factors in relation to fungus spoilage of dates, F. M. TURRELL, W. B. SINCLAIR, and D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Date Growers' Inst. Rpt.*, 17 (1940), pp. 5-11, figs. 8).

Chrysanthemum diseases curbed by propagating practices, P. P. PIRONE (*New Jersey Stat. Nursery Disease Notes*, 15 (1942), No. 4, pp. 13-16).—Notes on control of the foliar nematode (*Aphelenchoides ritzema-bos*) and *Verticillium* wilt by propagating practices.

The reaction of thirteen California species of Delphinium to powdery mildew, G. A. L. MEHLQUIST. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 411-413).—Resistance to *Erysiphe polygoni* was found to range from very high in *D. scopulorum glaucum* to extreme susceptibility in *D. uliginosum*. Relatively high resistance was found in *D. cardinale*—a fortunate circumstance since this species possesses several horticulturally desirable characteristics and may thus prove valuable in the development of varieties particularly adapted to the Southwest. From F_1 hybrids already obtained between *D. cardinale* and susceptible species, it was deemed evident that susceptibility to this disease is a dominant character.

Control of powdery mildew of roses in the greenhouse, W. D. McCLELLAN ([*New York*] *Cornell Sta. Bul.* 785 (1942), pp. 39, figs. 5).—Determining the toxicity of 50 fungicides to conidia of *Sphaerotheca pannosa rosae* on excised rose leaves by spore-germination tests, the marked superiority of sulfur-containing over copper-containing materials was clearly demonstrated. Of 14 coppers, only ammoniacal copper carbonate, Palustrex Sulfonate-B, and Eau Céleste reduced spore germination 75 percent or more, whereas of the sulfurs a similar reduction occurred in all but one test. Of 20 miscellaneous materials, Hellone Green, Hellone Yellow, malachite green, and Shirilan D reduced germination 75 percent or more. A method devised for comparing the toxicity of fungicides to conidia on rose leaves involves the germination of spores from the same population on different portions of the same excised leaf. Testing 10 materials, including a particulate S, soluble and insoluble coppers, and Ag, on conidia on rose leaves, when the conidia were not wet by the fungicide only S reduced spore germination appreciably, but when wet for a short time the soluble coppers as well as S markedly reduced germination. In commercial greenhouses, S dust proved ineffective, but good control was obtained with the 5 wettable sulfurs and the 1 Cu material tested when they were used in a protective-spray program

in combination with IN 438 at a concentration of 1:1,000, but marked differences between these and other materials occurred when used as eradican sprays.

Data are presented to show that surface tension and contact-angle measurements, when used as criteria of wetting agents, do not always rate wetting agents in the same order. Using a method described, the contact angles of 40 liquid materials on rose leaves were compared, and the age, surface, and variety of rose leaf used were all found to affect contact-angle measurements. When rose leaves first unfolded they were not especially difficult to wet, but became increasingly so up to the sixth day, after which they gradually became easier to wet. Marked differences in toxicity were found when 15 spray supplements were compared, IN 181 being most toxic. When compared in combination with the same particulate S in each test in an eradican-spray program under commercial-greenhouse conditions, striking differences in mildew control occurred. In a preliminary study of S vaporization for controlling mildew, it was found that although not enough S was deposited on rose leaves to inhibit germination, only 6.8 percent of the lesions remained active after a 3-day exposure to S vaporized at 112°-115° C., whereas 77.4 percent of the lesions remained active after a similar 3-day exposure to S vaporized at 85°. Data from a commercial greenhouse test showed that a considerable reduction in mildew can be obtained by syringing. The results of the whole investigation are presented in detail. An appendix indicates the sources and composition of materials used in this study. There are 40 references.

Defoliation of American holly cuttings by *Rhizoctonia*, J. S. COOLEY. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 10, pp. 906-910, figs. 2).—The leaf drop of American holly (*Ilex opaca*) cuttings described was found due to *R. solani*. A restricted temperature range of the fungus in culture was indicated, with the optimum at 25°-30° C. Prior treatment of contaminated cutting beds with disinfectants failed to give satisfactory control, but thorough sanitary measures were effective.

Plant pathology in relation to northeastern forest wildlife cover, J. PEARCE and P. SPAULDING. (Univ. Maine and U. S. D. A.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 3, pp. 194-202, pl. 1).—This contribution points out the significance of some common diseases of northeastern trees and shrubs used in wildlife management, and the important diseases of these plants that are of interest from this standpoint are tabulated and discussed. Mention is also made of the benefits to birds and other animals from forest fungi and insects.

Crown gall on species of Taxaceae, Taxodiaceae, and Pinaceae, as determined by artificial inoculations, C. O. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 32 (1942), No. 11, pp. 1005-1009, figs. 3).—From inoculations with *Phytoplasma tumefaciens* on 21 different conifers, galls developed on (Taxaceae) *Podocarpus elongata*, *Taxus baccata erecta*, *T. brevifolia*, *T. media*, and *Torreya californica*; (Taxodiaceae) *Cunninghamia lanceolata*, *Sequoia gigantea*, *S. sempervirens*, and *Sciadopitys verticillata*; and (Pinaceae) *Abies cephalonica*, *A. concolor*, *A. firma*, and *A. holophylla*.

Recent advances in our knowledge concerning the oak mildew disease, P. A. MILLER. (Calif. Expt. Sta.). (7. *West. Shade Tree Conf., Los Angeles, Calif., 1940, Proc. Ann. Mtg.*, pp. 64-70, figs. 3).—On powdery mildew of the coast live oak (*Quercus agrifolia*) and its control.

An undescribed *Atropellis* on cankered *Pinus virginiana*, M. L. LOHMAN, E. K. CASII, and R. W. DAVIDSON. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 10, pp. 296-298, fig. 1).—The fungus is described as *A. apiculata* n. sp.

Muerte del tamarisco, ocasionada por "Botryosphaeria tamaricis," en Corrientes, Argentina [Tamarisk canker due to *B. tamaricis* in Corrientes,

Argentina], M. J. FREZZI (*Rev. Argentina Agron.*, 9 (1942), No. 2, pp. 110-113, pls. 2, figs. 2).—This study concerns a canker of *Tamarix gallica* due to a fungus provisionally identified as *B. tamaricis*, which is described, along with its behavior in culture and on the host tree.

Three new *Cuscutas* from western North America, T. G. YUNCKER (*Bul. Torrey Bot. Club*, 69 (1942), No. 7, pp. 541-543, figs. 2).—Two new species and one new variety of these phanerogamic parasites are described.

A comparison of *Diplodia natalensis* from stained wood and other sources, A. F. VERRALL (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 10, pp. 880-885).—Considerable variation was found among the isolates used in rate of growth at 37° C., spore size, and general cultural appearance, but in no cultural characteristic studied did the isolates from stained lumber or logs differ materially from those from other sources. All of 13 isolates tested on pine and sweet gum sapwood were vigorous stainers, the 14 tested on citrus fruit caused rapid decay, and all 11 isolates tested on cotton caused black boll rot. None of the 10 isolates inoculated into small tung trees was sufficiently pathogenic to cause more than small temporary cankers. It thus seems that the *D. natalensis* causing stain in lumber and logs is, at least from a practical point of view, the same fungus as the strains secured from several other plants. Little fruiting of *D. natalensis* was observed on stained logs and lumber from which it was isolated. Because of the similarities among isolates of this fungus from stained wood and other sources, it seems probable that some of the inoculum inducing wood stain in logs and lumber is derived from spores produced on such plants as cotton.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Late fall and winter food of foxes in central Massachusetts, A. E. MACGREGOR (*Jour. Wildlife Mangt.*, 6 (1942), No. 3, pp. 221-224).—A study of the contents of 70 stomachs and 164 droppings of foxes collected in and around the Harvard Forest, Petersham, during the fall and winter of 1937 and 1938, here reported upon, indicates that they were not of great importance in that locality as predators of game birds. They drain heavily on the cottontail rabbit population, but this is balanced by the number of field mice they destroy.

Fluctuations in numbers of the muskrat (*Ondatra zibethica*) in Canada, C. ELTON and M. NICHOLSON (*Jour. Anim. Ecol.*, 11 (1942), No. 1, pp. 96-126, figs. 21).—This contribution is presented with a list of 27 references to the literature.

Parasitological survey of Louisiana muskrats, G. H. PENN, JR. (*Jour. Parasitol.*, 28 (1942), No. 4, pp. 348-349).

Home range of the cottontail rabbit, A. O. HAUGEN (*Ecology*, 23 (1942), No. 3, pp. 354-367, figs. 6).

Body weight and sex ratio of cottontail rabbits, W. H. EIDER and L. K. SOWLS. (Univ. Wis.). (*Jour. Wildlife Mangt.*, 6 (1942), No. 3, pp. 203-207, fig. 1).

The habitat distribution of the grey squirrel (*Sciurus carolinensis*) in Savernake Forest, M. K. COLQUHOUN (*Jour. Anim. Ecol.*, 11 (1942), No. 1, pp. 127-130).

The winter food habits of the short-tailed weasel [*Mustela cicognanii*] in northern Minnesota, S. E. ALDOUS and J. MANWEILER (*Jour. Mammal.*, 23 (1942), No. 3, pp. 250-255).

Studies of waterfowl in British Columbia: Buffle-head, J. A. MUNRO (*Canad. Jour. Res.*, 20 (1942), No. 6, Sect. D, pp. 133-160, pls. 2).—Record is made of the distribution, numerical status, and seasonal movements of *Charitonetta albcola* in British Columbia, where it is a common summer visitant of the interior, as

well as its plumage sequence, behavior, and food as determined through the study of stomach contents. Aquatic insects formed the principal food in the summer and autumn diet in much of the area surveyed.

Protein requirements of bobwhite quail chicks for survival, growth, and efficiency of feed utilization, R. B. NESTLER, W. W. BAILEY, and H. E. MCCLURE. (U. S. D. A. et al.). (*Jour. Wildlife Mgmt.*, 6 (1942), No. 3, pp. 185-193, pl. 1, figs. 5).

Ecological and mortality factors affecting the nesting of the Chinese pheasant [*Phasianus colchicus torquatus*] in the Willamette Valley, Oregon, C. R. EKLUND. (Oreg. Expt. Sta. et al.). (*Jour. Wildlife Mgmt.*, 6 (1942), No. 3, pp. 225-230).

Food habit trends of the wild turkey in Missouri as determined by dropping analysis, P. D. DAIKE, W. K. CLARK, JR., and L. J. KORSCHGEN. (Univ. Mo. et al.). (*Jour. Wildlife Mgmt.*, 6 (1942), No. 3, pp. 237-243, figs. 3).—Report is made of a study of the food habits of the wild turkey, based upon data obtained from the examination of 3,244 droppings collected at random from wildlife refuges in the Ozark Mountains from September 1938 to October 1940. Trends in the seasonal food habits are shown to correspond with availability of the different classes of food. Plant foods comprised approximately 75 percent of the annual subsistence, grass seeds and blades and acorns being most important. Insect foods made up the remaining 25 percent of the diet, beetles, grasshoppers, and ants comprising nearly four-fifths of all the animals eaten.

Earthworms of the northeastern United States: A key, with distribution records, T. H. EATON, JR. (Cornell Univ.). (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 8, pp. 242-249, fig. 1).—This contribution includes a key to the earthworms of the northeastern United States, distribution records, and a list of 32 references to the literature.

A modification of zinc sulfate centrifugal flotation method for recovery of helminth ova in formalinized feces, W. A. SUMMERS (*Jour. Parasitol.*, 28 (1942), No. 4, pp. 345-346).

Applied entomology: An introductory textbook of insects in their relations to man, H. T. FERNALD and J. H. SHEPARD (*New York and London: McGraw-Hill Book Co.*, 1942, 4. ed., [rev.], pp. IX+400, figs. 383).—A revised edition of this work (E. S. R., 73, p. 641).

A device for marking fields on microscope slides, C. OLSON, JR. (Mass. Expt. Sta.). (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 7, pp. 939-940, fig. 1).

The use of the square root transformation and analysis of variance with contagious distributions, W. M. UPHOLT. (S. C. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 536-543, figs. 2).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 507, 593-608, figs. 8).—Contributions presented (E. S. R., 88, p. 72) are: Mexican Fruitfly Found in Illinois, by C. L. Metcalf (p. 507) (Univ. Ill.); Notes on the Biology of *Microbracon hebetor* [Say], by A. W. Morrill, Jr. (pp. 593-594), Effect of Insecticidal Drift in Small Plots Upon Boll Weevil and Cotton Aphid (pp. 594-595) and Notes on the Control of Cotton Aphids (pp. 598-599), both by G. L. Smith, A. L. Scales, and J. A. Fontenot, Notes on the Effect of Arsenicals Upon the Cotton Aphid, Predators, and Other Insects, by G. L. Smith and J. A. Fontenot (p. 596), Methods of Rearing the Pink Bollworm Parasites *Chelonus* and *Microbracon*, by L. W. Noble and W. T. Hunt (p. 597), Laboratory Tests on the Toxicity of Insecticides to the Strawberry Weevil, by H. N. Pollard and W. A. Thomas (pp. 599-600), Effect of Sterile and Unsterile Foods on Rate of Development of Wireworms, by M. W. Stone (pp. 600-601), An Insect Rearing Box With Electric Barriers, by M. C. Swingle and A. M. Phillips (pp. 603-604), and Life-History of the Corn Sap Beetle in Rice, by A. I. Balzer (pp.

606-607) (all U. S. D. A.); An Amphipod Household Pest *Asiaticus sylvaticus* [Haswell] in California, by A. Mallis (p. 595), Ambrosia *Attack De-*
ciduous Fruit Trees in California, by E. G. Linsley and G. *od* (p. 601),
and Some Quantitative Studies of *Lygus* Injury to Alfalfa, by G. F. Mac-
Leod and L. R. Jeppson (pp. 604-605) (all Univ. Calif.); Range Lizards as Insect
Predators, by G. F. Knowlton (p. 602) (Utah Expt. Sta.); A New Pest [*Teleo-*
nemia nigrina Champ.] of Snapdragon and Verbena, by E. Hixson (pp. 605-606);
An Additional Observation on the Biology of *Erynnia nitida*, by S. E. Flanders
(p. 607) (Calif. Citrus Sta.) (E. S. R., 84, p. 642); Some Observations on the
Effects of Sulfur Compounds Applied During Bloom on Bee Behavior, by F. R.
Shaw and A. I. Bourne (pp. 607-608) (Mass. State Col.); and *Prionus laticollis*
(Drury) in a Subterranean Wooden Duct for Telephone Cables, by W. B. Becker
(p. 608) (Mass. Sta.).

Entomological progress, III, assembled by C. O. Eddy. (Partly coop. U. S. D. A.). (*Louisiana Sta. Bul.* 350 (1942), pp. 52).—This third group of papers (E. S. R., 84, p. 357) presents results of station work on insect pest control in the State as follows: Cotton Flea Hopper Control in Louisiana, 1940, by I. J. Beemel (pp. 3-9); Cryolite as an Insecticide, II (pp. 9-11) (E. S. R., 84, p. 357). A New Practice for Red Spider Control on Strawberries (pp. 39-40), Peach Insects (pp. 45-47), The Sand Wireworm (p. 51), and Potato Tuber Injury (p. 52), all by C. O. Eddy; Notes on the Biology and Seasonal History of the Sweet Potato Weevil in Louisiana, by E. H. Floyd (pp. 12-16); Notes on the Biology and Control of the Velvetbean Caterpillar (*Anticarsia gemmatilis* Hbn.), by L. O. Ellisor (pp. 17-23); Insecticidal Tests Against Cabbage Caterpillars, by C. E. Smith and R. W. Brubaker (pp. 23-31); Losses Caused by Sugarcane Borer to Sugarcane in Louisiana in 1940, by A. L. Dugas and J. W. Ingram (pp. 32-34); A Summary of Recent Investigations of Sugarcane Borer Control With Cryolite and Other Insecticides, by J. W. Ingram and A. L. Dugas (pp. 34-39); Toxicity of Poison Baits to the Sweet Potato Weevil *Cylas formicarius* Fab., by E. H. Floyd and L. D. Newsom (pp. 40-45); and Notes on the Reaction of the Sweet Potato Weevil Under Different Qualities of Light (pp. 47-50).

[Entomological investigations by the Ohio Station] (*Ohio Sta. Bul.* 617 (1940), pp. 25-33, 69, figs. 5).—A progress report (E. S. R., 83, p. 518) noting new materials that control peach tree borer safely, new sprays for apple aphids, development of potatoes resistant to leafhoppers, wireworm investigations, insect control in relation to squash yields, iris borer killed by insecticide, tomato fruitworm and corn borer investigations, the two-queen hive system superior, and influence of sunflowers on wireworm populations.

[Insect investigations by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1941], p. 27).—A progress report (E. S. R., 85, p. 787) noting attack of cutworms and webworms and means for their control.

Distribution and origin of some eastern oceanic insects, E. C. ZIMMERMAN. (Univ. Hawaii et al.). (*Amer. Nat.*, 76 (1942), No. 764, pp. 280-307, figs. 10).

Insect problems resulting from changes in agriculture in Arkansas, D. ISELY. (Univ. Ark.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 473-477).

Cotton insect investigations. (Coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul.* 32 (1941), pp. 70-72).—Progress is again noted (E. S. R., 86, p. 216) on the control of boll weevil, bollworms, and aphids on upland and sea-island cotton.

Calcium arsenate with and without aphicides for control of boll weevil and cotton aphid, M. T. YOUNG, G. L. GARRISON, and R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 490-492).—It was found in experiments with the boll weevil and cotton aphid near Tallulah, La., in 1941 that "calcium arsenate, zinc-safened calcium arsenate, mixtures of calcium arsenate contain-

ing 0.5 percent of rotenone, and mixtures of calcium arsenate containing 0.5, 1, and 2 percent of nicotine were equally effective against the boll weevil, and each was followed by significant boll weevil control over the checks. Zinc-safened calcium arsenate did not prevent the aphid infestation from increasing to injurious numbers. The calcium arsenate and rotenone mixtures made from derris, cube, or timbo were equally effective against the cotton aphid and gave highly significant decreases in aphid infestation and increases in yield when compared with calcium arsenate alone. A mixture of calcium arsenate and 0.5 percent of nicotine applied in the late afternoon gave better aphid control and a greater yield than either a similar mixture or a mixture of calcium arsenate and rotenone applied in the early morning. Mixtures of calcium arsenate and nicotine gave better aphid control and a greater yield than a mixture of calcium arsenate and rotenone. Dust made with nicotine sulfate was more effective in controlling aphids than that made with free nicotine. Alternate applications of calcium arsenate and a mixture of calcium arsenate and 2 percent of nicotine were much more effective in controlling aphids and gave greater yields than alternate applications of calcium arsenate and a mixture of calcium arsenate and 1 percent of nicotine or a mixture of calcium arsenate and 0.5 percent of nicotine."

Effect of boll weevil and cotton aphid control on yield as shown in a factorial experiment in 1941, R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 493-495).

[Contributions on fruit insects] (*N. Y. State Hort. Soc. Proc.*, 87 (1942), pp. 25-34, 42-56, 170-172, 200-206, 291-303).—Among the contributions presented at the annual meeting held in January 1942 are the following: Fruit Insect Problems in 1941, by J. A. Evans (pp. 25-34) (Cornell Univ.); Recent Developments in the Use of Petroleum Oils as Insecticides, by P. J. Chapman (pp. 42-44), Control of Bud Moth and Rosy Apple Aphid, by F. Z. Hartzell (pp. 45-51), Latest Developments in Codling Moth Control, by S. W. Harman (pp. 51-56), The Status of Peach Tree Borer Control in New York State, by E. H. Smith (pp. 170-172), and Possibility of Controlling Oriental Fruit Moth With Insecticides, by R. W. Dean and E. H. Smith (pp. 200-202) (all N. Y. State Expt. Sta.); Early Season Vs. Summer Control Measures for European Red Mite (pp. 202-206) and Emergence, Migration, and Control of the Apple Maggot (pp. 291-295), both by R. W. Dean; and Making Codling Moth and Apple Maggot Sprays Effective, by O. B. Hammer (pp. 295-303).

Insects of the pecan in middle Georgia, T. L. BISSELL. (Ga. Expt. Sta.). (*Southeast. Pecan Growers Assoc. Proc.*, 36 (1942), pp. 54, 56-58).—Particular mention is made of the shuckworm, black aphid, fall webworm, flat-headed borer, and twig girdler as insects of importance in middle Georgia. Tables are given which show the damage caused by the shuckworm in this area in 1929, 1931, and 1932.

Annual report of the forest insect survey, 1941, A. W. A. BROWN (*Canada Dept. Agr., Forest Insect Survey Ann. Rpt.*, 1941, pp. 23, figs. 10).—A report of the occurrence of forest insects in 1941 accompanied by nine maps and a chart summarizing the occurrence of outstanding forest insects in each district and a tabulated summary arranged by hosts.

Some notes on the integument of insects in relation to the entry of contact insecticides, V. B. WIGGLESWORTH (*Bul. Ent. Res.*, 33 (1942), No. 3, pp. 205-218, figs. 6).—It was found that insects immersed in oils exude minute droplets of water over the surface of the cuticle. "These appear more rapidly in light oils than in heavy oils and are more numerous in young insects than in old. Immersed in mixtures of oils and alcohols which separate in contact with water, they show a vigorous effervescence at those regions where the mixture penetrates

most rapidly to the water in the cuticle. There is a delay of varying duration at different parts of the cuticle when heavy oils are used. This delay disappears if the lipid layer is first extracted with petroleum ether. Factors controlling the rate of entry of pyrethrum through the cuticle have been studied by the application of pyrethrum in oil to a restricted area of the abdomen of nymphs and adults of *Rhodnius*. Entry is more rapid in light than in heavy petroleum oils; it is much accelerated if the cuticle is first treated with petroleum ether. Entry is very slow in vegetable oils. There are great individual variations, due chiefly to the thickness of the endocuticle, which in turn is determined by the size of meal taken before molting, the age and the amount of food taken after molting, and the degree of stretching of the cuticle. There is evidence that the pore canals are important in the passage of pyrethrum through the endocuticle. Histological examination of the integument shows that in the nymph of *Rhodnius* oils are taken up first by the epidermal cells in the zone around the bristles, later by the general epidermis. The uptake of oil is greatly increased if 5 percent of oleic acid is added to refined petroleum. In the adult *Rhodnius* soon after molting, oils are taken up by the general epidermis. In old insects they are taken up solely by the dermal glands. There is no visible entry through the sockets of the bristles. The entry of pyrethrum in oils is accelerated by the addition of oleic or other fatty acids."

A method for determining insecticidal effectiveness using *Aphis rumicis* and certain organic compounds, W. MOORE and C. I. BRISS. (Conn. [New Haven] and [Conn.] Storrs Expt. Sta. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 544-553, figs. 2).—Report is made of the quantitative comparison of 5 substituted glycinonitriles and a mixture of 1 of the 5 with dioctyl fumarate with a standard nicotine insecticide, following preliminary tests with more than 400 chemicals in contact sprays against the bean aphid. "By a simplified procedure, which is described, parallel dosage-mortality curves in terms of log-concentrations and empirical probits were computed for the three tests of all 7 chemicals and from them the log-concentration killing 95 percent of the aphids. The mean log-LD95 for each chemical was then corrected for differences in the over-all susceptibility of the aphids between days. The calculation of these relative toxicities and their experimental errors is described in full. The 2 amyl phenyl glycinonitriles were less than half as toxic as the dibenzyl, benzyl phenyl, and diphenyl glycinonitriles, which compared favorably with Black Leaf 40, a standard 40-percent solution of nicotine."

Compatibility of copper fungicides with nicotine bentonite insecticides, J. E. FAHEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 517-520).—A laboratory study was made of the effect of copper fungicides and nicotine bentonite insecticides on the water-soluble nicotine and water-soluble copper contents of the water phase of spray mixtures of these materials. The chemical analyses of 17 copper fungicides are reported. Preliminary experiments show that a $\frac{1}{32}:\frac{1}{16}:100$ bordeaux mixture has a measurable effect on the water-soluble nicotine content of nicotine bentonite sprays. As the bordeaux concentration is increased there is a corresponding increase in the pH and the water-soluble nicotine content of the spray mixture. Copper fungicides that produce strongly alkaline (above pH 8.5) spray mixtures, alone or in combination with nicotine bentonite insecticides, will result in a large increase in the soluble-nicotine content of nicotine bentonite spray mixtures. Nicotine bentonite insecticides that contain or are used with unaltered bentonite reduce the soluble-copper content of the copper fungicide sprays. A factory-processed nicotine bentonite insecticide was found to increase the soluble-copper content of the fungicide spray mixtures. It is pointed out that these results apply only to spray mixtures and should not be interpreted as applying to spray residues.

Carriers of rotenone dusts, II. F. WILSON and R. L. JAMES. (Univ. Wis.). (*Soap and Sanit. Chem.*, 18 (1942), No. 4, pp. 103, 105).—A brief report is made of a study of 37 different samples of talc and pyrophyllite obtained from nine States. Five of the samples examined were classified superior, 6 fair, and the remainder very poor. Of the 3 samples of pyrophyllite that were examined, 1 was superior, 1 fair, and 1 very poor.

Sodium fluoride, II. L. SWEETMAN and H. LAUDANI. (Mass State Col.). (*Soap and Sanit. Chem.*, 18 (1942), No. 4, pp. 90-93, figs. 3).—The results of studies of the toxicity of sodium fluoride for the American cockroach, including the lethal effects of injections into the digestive tract and the observed responses following such injections, the effects of sodium fluoride on American and German cockroaches after running through a runway dusted with the poison, and the relationship between the time required to kill and the amount of sodium fluoride observed on German cockroaches, are reported in tables. Sodium fluoride is shown to be an active stomach poison in the gut of the American cockroach, but these cockroaches are repelled by food containing it. Neither the American nor the German cockroach appears to swallow a lethal dose during the cleaning processes after running over surfaces dusted with the poison. The authors feel justified in concluding that in the practical control of these pests it is of little or no value as a stomach poison, but that it is effective as a contact poison. See also a previous note (E. S. R., 85, p. 87).

Insecticidal action of some pyrrolines and pyrrolidines on *Thermobia domestica*, J. G. KIRCHNER and C. H. RICHARDSON. (Iowa Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 525-530).—In a laboratory study of 14 α -substituted pyrroline and pyrrolidine derivatives as contact insecticides against the firebrat, the physiological action of these compounds was found to resemble that frequently observed for nicotine.

Circulation of hemolymph in the wings of the [German] cockroach (*Blattella germanica* L.).—I, In normal wings; III, Circulation in the articular membrane: The significance of this membrane, the pteralia, and wing folds as directive and speed controlling mechanisms in wing circulation, S. CLARE and O. E. TAUBER. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 2, pp. 107-127, figs. 3; 16 (1942), No. 3, pp. 349-356, figs. 2).

Circulation of hemolymph in the wings of the [German] cockroach (*Blattella germanica* L.).—II, Effects of cutting hemolymph channels in the normal tegmen and hind-wing, S. CLARE and O. E. TAUBER. (Iowa State Col.). (*Ann. Ent. Soc. Amer.*, 35 (1942), No. 1, pp. 57-67, figs. 4).—No. 2 of this series (see above).

Circulation in the wings of the [German] cockroach (*Blattella germanica* L.).—IV, Circulation in unsclerotized wings under normal and experimental conditions, O. E. TAUBER and S. CLARE. (Iowa Expt. Sta.). (*Amer. Micros. Soc. Trans.*, 61 (1942), No. 3, pp. 290-296, figs. 2).—A further contribution.

Host distribution of lice on native American rodents north of Mexico, W. L. JELLISON (*Jour. Mammal.*, 23 (1942), No. 3, pp. 245-250).

Insecticidal control of legume bugs in seed alfalfa, R. A. FISHER and W. E. SHULL. (Idaho Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 503-507, figs. 4).—The results of experimental control work with legume bugs, particularly *Lygus hesperus* Kngt. and *L. elisus* Van D., which are a contributing factor to many of the failures in the production of alfalfa seed in the Western States, are reported. A dust mixture of Dry Pyroicide and cube, containing 0.125 percent pyrethins and 0.50 percent rotenone, gave good kills of the nymphs and adults in laboratory experiments. Kills approaching 90 percent were obtained in the field with a pyrethrum-cube dust, but the fields were soon heavily reinfested, and no benefit was derived from the control operations. A 20 percent sodium

arsenite dust gave good laboratory control of the insects and may be of value in field control.

A new chinch bug from Argentina (Hemiptera: Lygaeidae), C. J. DRAKE (*Rev. Ent.*, 12 (1941), No. 3, pp. 514-515).—Under the name *Blissus penningtoni* description is given of a new chinch bug from Argentina, the third species of the genus to be recorded from that country.

Time of planting susceptible beans in relation to curly top injury in south-central Idaho, A. O. LARSON and H. C. HALLOCK. (U. S. D. A. coop. Idaho Expt. Sta. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 565-569, figs. 3).—The experiments reported have shown that garden bean varieties planted just before or at about the start of the spring migration of the beet leafhopper in the Twin Falls district of Idaho and in the district immediately east of Twin Falls should nearly always escape severe injury from curly top disease. The planting of garden varieties, susceptible Great Northern, or pinto beans at any time in the west districts, such as beyond Flier and around Buhl, Castleford, and Clover, is attended by a very high degree of risk, but some chance of reducing losses from damage by curly top is afforded by early planting.

Rotenone in combination with calcium arsenate for cotton aphid control, C. F. RAINWATER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 500-503).—Experiments conducted at seven locations in six States during 1941 in which rotenone was added to calcium arsenate for control of the cotton aphid are reported. Calcium arsenate plus 0.5 percent rotenone was found to be effective in keeping the aphid population at or below that in untreated check plats and caused a significant increase in yield over plats treated with calcium arsenate alone under conditions of heavy boll weevil injury. A mixture of equal parts of calcium arsenate and sulfur plus 0.25 percent of rotenone was not significantly different in effectiveness from calcium arsenate plus 0.5 percent of rotenone, but the latter combination generally caused significant increases in yield over calcium arsenate alone, whereas the former did not. Less than 0.5 percent of rotenone in calcium arsenate and less than 0.25 percent in calcium arsenate-sulfur were not very effective in keeping the aphid population down. Calcium arsenate plus 0.5 percent of rotenone gave larger but not significant increases in yield and fewer aphids than calcium arsenate-sulfur plus 0.25 percent of rotenone. The records obtained at Tallulah, La., showed that derris, cube, and timbo were equally effective as sources of rotenone. The records at Florence, S. C., showed that sulfur, diatomaceous earth, clay, pyrophyllite, and walnut-shell flour were equally effective as diluents for calcium arsenate and rotenone.

Relation of fertilizers to the development of the cotton aphid, R. L. MCGARR. (U. S. D. A. coop. Miss. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 482-483, fig. 1).—The author's findings indicated that nitrogenous fertilizer causes a definite increase in aphids when cotton is dusted with calcium arsenate, but that there is no appreciable increase when this insecticide is not used.

Amphorophora osborni (Homoptera: Aphididae), G. F. KNOWLTON. (Utah Expt. Sta.). (*Pan-Pacific Ent.*, 18 (1942), No. 3, p. 143, fig. 1).—A new aphid found associated with *A. ribellu* (Davis) on the black currant in Utah is described as *A. osborni* n. sp.

Laboratory fumigations of the California red scale with methyl bromide, alone and with hydrocyanic acid, H. R. YUST, R. L. BUSBY, and L. B. HOWARD. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 521-524).—Female scales of all developmental stages and many different ages killed by methyl bromide fumigation were slower to develop visible characteristics of death than were those killed by hydrocyanic acid fumigation. "Scales in the early second stage, early gray adults, and mature females were most difficult to kill. Scales in the

second molt, which are especially difficult to kill with hydrocyanic acid fumigation, were killed relatively easily with methyl bromide fumigation. Complete mortality was obtained upon fumigation with a methyl bromide concentration of 40 mg. per liter for 3 hr. at a constant temperature of 77° F. A concentration that gave 99.5-percent kill of mature female scales at 77° gave only a 16.4-percent kill at 50°. Fumigation with a mixture of hydrocyanic acid and methyl bromide resulted in a synergistic action on the scales in the gray adult stage and an antagonistic action on the mature female scales. The difference in the reaction of two developmental stages of the same insect suggests the importance of studying more than one stage in insecticide tests. Prefumigation with a sublethal dosage of methyl bromide reduced the kill of the California red scale produced by hydrocyanic acid."

The life history of *Phyllophaga farceta* and *P. crassissima*, H. J. REINHARD. (Tex. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 576-582).—The life cycle of a generation of *Phyllophaga farceta* and *P. crassissima* in Texas is reported upon, the details being given in tables.

Symposium on wireworm investigations (*Ann. Appl. Biol.*, 29 (1942), No. 2, pp. 144-196, figs. 15).—Contributions presented at a symposium held on October 10, 1941, include Investigations on Wireworms—Introductory, by J. C. F. Fryer (pp. 141-149); Wireworms and Crop Production, by S. G. Jary (pp. 150-155); Statistical Problems in Field Sampling for Wireworms, by F. Yates and D. J. Finney (pp. 156-167); Observations on Some Factors Influencing Growth in Wireworms of the Genus *Agriotes* Esch., by A. C. Evans and H. C. Gough (pp. 168-175); Wireworms and Agriculture, With Special Reference to *Agriotes obscurus* L., by H. W. Miles (pp. 176-180); and Observations on the Biology of *Agriotes obscurus* L.—The Adult Insect, by M. Cohen (pp. 181-196).

Biological notes on the basswood leaf-miner *Baliosus ruber* (Weber). A. C. HOBSON. (Minn. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 570-573, figs. 2).—Observations of *B. ruber*, a beetle leaf miner which attacks the basswood (*Tilia americana*) throughout its range, are reported.

Biology of two native coleopterous predators of the mountain pine beetle in sugar pine, G. R. STRUBLE. (U. S. D. A.). (*Pan-Pacific Ent.*, 18 (1942), No. 3, pp. 97-107, figs. 3).—Two native important coleopterous predators of bark beetles commonly associated with infestations in many conifers in the West, studies of the biology of which are here reported, are *Tennochila virescens* (F.), of the family Ostomatidae, and *Enoclerus sphaegeus* (F.), of the family Cleridae. In sugar pine they are associated with infestations of the mountain pine beetle. Their habits and life histories with this host were investigated as a preliminary step to determine their importance as control factors.

Four new species of white-fringed beetles (subgenus *Graphognathus*) from the southeastern part of the United States (Coleoptera: Curculionidae), L. L. BUCHANAN (*Bul. Brooklyn Ent. Soc.*, 37 (1942), No. 3, pp. 107-110).—Four species of the genus *Pantomorus* (to which the white-fringed beetle belongs), all thought to be accidentally introduced from South America, are described as new.

Further tests of dichloroethyl ether and of jarring to control plum curculio, O. I. SNAPP. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 514-516, figs. 3).—Experiments in the laboratory and on caged peach trees have shown dichloroethyl ether to be effective against the plum curculio in the soil. In a commercial peach orchard two applications of dichloroethyl ether on the soil under the spread of the trees, plus 12 jarrings, gave as good control of the plum curculio as the regular schedule of lead arsenate sprays on the fruit. No injury to vegetation under the spread of the peach trees or to any part of the

trees or foliage could be discerned from the two applications of dichloroethyl ether on the soil.

Experiments on time to begin dusting with calcium arsenate and number of applications for boll weevil control, M. T. YOUNG, G. L. GARRISON, and R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 484-486).—Report is made of work conducted near Tallulah, La., in 1940 and 1941 with a view to securing information on the time to commence dusting with calcium arsenate and the number of applications for the most economical control of boll weevil in that locality, the details being given in a table.

Boll weevil control with calcium arsenate applied at different times of day and at different time intervals, M. T. YOUNG, G. L. GARRISON, and R. C. GAINES (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 487-489).—In experiments conducted near Tallulah, La., from 1934 to 1941, inclusive, during 6 of the 8 yr. applications of calcium arsenate applied during the early morning gave an average increase over the checks of 309 lb. of seed cotton per acre, those applied near midday 311 lb., and those during the late afternoon 264 lb. From 1934 to 1941, inclusive, applications of calcium arsenate made at 4-day intervals gave an average increase over the checks of 208 lb. of seed cotton per acre, those at 6-day intervals 143 lb., and those at 8-day intervals 100 lb.

Boll weevil hibernation, survival, and emergence under South Carolina conditions, F. F. BONDY and C. F. RAINWATER. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 495-498).—Studies made of the factors that influence the boll weevil's abundance with particular reference to hibernation, survival, and emergence, conducted in the vicinity of Florence, S. C., are reported. They included cage tests, examination of Spanish moss and woods trash, and trap-crop emergence.

Mopping, dusting, and combination treatments for boll weevil control in South Carolina, F. F. BONDY. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 498-499).—The results of 187 field experiments conducted against the boll weevil at Florence, S. C., over a 14-yr. period, 1928-41, to determine the comparative value of (1) a 1-1-1 mopping mixture of calcium arsenate, molasses, and water applied to cotton in the presquare stage, (2) calcium arsenate dust applied after 10 percent of the squares had been punctured, and (3) a combination of these two treatments are reported. The average increases in yield over comparable untreated check plats were 39, 286, and 331 lb. of seed cotton per acre, respectively, with average net profits of \$1.10, \$9.60, and \$11.40 per acre for the three treatments.

The pepper weevil, J. C. ELMORE (U. S. Dept. Agr. Leaflet 226 [1942], pp. 8, figs. 6).—Both larvae and adults of this weevil cause damage to peppers. Eggs are deposited in blossom buds where hatching occurs in 3 or 4 days. The small grubs feed inside the buds or among the seeds of the immature pods and reach maturity in from 8 to 10 days. After 4 to 6 days the pupae become adults, which crawl to the outside through round holes made in the rind of the pods. In California from five to eight generations develop annually. Two or 3 weeks are required for complete development in warm weather and 5 to 6 weeks in cool weather. Adults remain on green pepper, nightshade, or other hosts during the winter. Dusting plants at weekly intervals with cryolite containing 50 percent sodium fluoaluminat is a suggested control. The control value of certain cultural practices such as disking or plowing when the crop is harvested, destroying nightshade and other hosts not later than January 15, early planting and the use of early-maturing varieties is mentioned.

The influence of lime on the toxicity of lead arsenate to cabbage worms, G. E. R. HERVEY and G. W. PEARCE. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*,

35 (1942), No. 4, pp. 554-558, figs. 3).—The results of experiments in 1940 and 1941 for the control of the cabbage worm, aimed at determination of the comparative effectiveness of dusts containing hydrated lime, Loomkill Talc, Pyraux ABB, and Bancroft Clay as diluents and lead arsenate sprays with and without lime, are reported. All treatments containing lime showed markedly lower control efficiencies. Data on the arsenical residue loads of the various treatments are presented to show that the effect of lime on control is not accounted for by differences in arsenical load but to an actual reduction in the toxicity of the lead arsenate. A brief discussion of the possible mechanism of this observation is included.

Two treatments for the control of peach tree borer, T. H. JONES (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 10, p. 7).—A practical account.

Epicallima coloradella (Wals.), an inhabitant of perennial apple cankers in the Northwest, M. A. YOTHERS. (U. S. D. A.). (*Jour. Econ. Ent.* 35 (1942), No. 4, pp. 573-576, figs. 3).—A study of the oecophorid moth *E. coloradella*, one of the most common inhabitants of the perennial apple canker in the Wenatchee, Wash., district, made during the course of a study of the woolly apple aphid.

Ovicidal value of light mineral oils for the codling moth, R. L. WEBSTER and E. C. CARLSON. (Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 530-533).—The data presented indicate that light petroleum oils (viscosity 50-55) with a high unsulfonatable residue and at a concentration of 0.5 percent have a high ovicidal value (92 percent mortality or better) for the codling moth.

Recent progress in codling moth control in British Columbia, I, II (*Sci. Agr.*, 22 (1942), No. 10, pp. 571-583).—Progress in control work with the codling moth as relates to killing of the mature larva is reported upon by A. D. Heriot (pp. 571-576) and to killing the adult, by A. A. Dennys (pp. 577-583). The laboratory and field control investigations with the adult, conducted at Vernon, B. C., have shown that a considerable measure of control can be obtained by the use of summer sprays that do not kill the larva but kill the moth itself. So far, two derivatives of dinitrophenol have been used in the field, namely, ammonium dinitrocresylate and sodium dinitrocresylate. It is possible other compounds will prove more suitable. The effects of these substances may be additive to those of the customary larvicides. Very little material is used, so the cost is low. Substances such as lead arsenate or cryolite that are toxic to the larva seem to be relatively nontoxic to the moth. On the other hand substances toxic to the moth at low concentration may be innocuous to the larva. Perhaps the fact that the reaction of the alimentary tract is alkaline in the larva and appears to be acid in the moth has some bearing on that point.

The main experiment with the larvae here described, which involved 5.5 acres, has shown that under conditions of heavy infestation and where the trees have not been scraped a single dormant application of an oil solution of dinitrocresol to trunks and main limbs is highly effective in reducing the degree of codling moth infestation at harvest. Such a procedure in fact appears to be a valuable supplement to the usual summer sprays. It has a serious fault, however, in the tendency of the oil carrier to injure the trees, but this fault does not appear to be insurmountable, and further experiment along two lines is indicated.

Manual infestation of corn strains as a method of determining differential earworm damage, R. A. BLANCHARD, A. F. SATTERTHWAIT, and R. O. SNELLING. (U. S. D. A. coop. Ill. Nat. Hist. Survey and Ill. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 508-511).—Description is given of a method of controlled infestation of the corn earworm for use in investigational work.

Control of earworms in corn by birds, G. W. BARBER. (U. S. D. A.). *Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 511-513).—Description is given of a 5-acre field

of corn in which birds had fed to an unusual extent upon larvae of the corn earworm and the fall armyworm infesting the ears.

The wheat field survey for 1942, T. H. PARKS and R. H. DAVIDSON (*Ohio Sta. Bmo. Bul.* 218 (1942), pp. 156-159, figs. 2).—A continuation of this annual wheat field survey (*E. S. R.*, 86, p. 216) as to hessian fly status.

Breeding habits of a rice field mosquito, W. R. HORSEFALL. (*Ark. Expt. Sta.*). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 478-482).—A study of *Psorophora confinnis* (Ly. Arrib.), the dominant and most important pest in the rice-growing areas of Arkansas, is reported upon, the details of the abundance of the larvae in rice fields in 1940 and 1941 and in ditches in 1940 being given in tables. It occurs all summer as a general pest, and at times livestock suffer severely.

Observations on the macroscopic species—identification of larval Anopheles in Georgia, R. E. BELLAMY (*Jour. Parasitol.*, 28 (1942), No. 4, pp. 299-310).

Mosquito studies in military establishments in the Seventh Corps Area during 1941, S. J. CARPENTER (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 558-561, fig. 1).

Measurements of larval populations of Anopheles quadrimaculatus Say, M. H. GOODWIN, JR., and D. E. EYLES (*Ecology*, 23 (1942), No. 3, p. 376).

Observations on the biology of the carrot [rust] fly (*Psila rosae* Fab.) : Assembling and oviposition, F. T. BAKER, I. E. KETTERINGHAM, S. P. V. BRAY, and J. H. WHITE (*Ann. Appl. Biol.*, 29 (1942), No. 2, pp. 115-125, figs. 6).—Observations on the movement and oviposition of carrot rust flies in and near fields of carrots in north Lincolnshire led to the conclusion that there is no evidence to indicate migration. Dispersal is general and is influenced by the wind. When the wind is not too strong some flies leave the hedges and when again seeking shelter tend to fly down wind. This results in a temporary spread in the direction in which the wind is blowing. The flies remain assembled in large numbers in the hedges surrounding the previous year's crop for a considerable period of time. Eggs are laid in $\frac{1}{2}$ -1-in. crevices in proximity to the carrot drill row.

Studies of fluctuations in insect population.—IX, The carrot-fly [carrot rust fly] (*Psila rosae*) in 1936-41, H. F. BARNES (*Jour. Anim. Ecol.*, 11 (1942), No. 1, pp. 69-81, pl. 1, figs. 3).—This ninth contribution (*E. S. R.*, 86, p. 214) deals with the fluctuations in insect populations studied in an outdoor unheated insectary, the previous eight having dealt with various species of gall midges. The data given cover the years 1936-41, inclusive.

Filth flies as transmitters of *Endamoeba histolytica*, A. C. PIRKIN (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 1, pp. 46-48).—From the evidence here cited it is considered highly probable that the five species of filth flies employed in the experiments, namely, *Sarcophaga misera*, *Phormia regina*, the secondary screwworm, *Lucilia pallidescens*, and the housefly, play no important role as transmitters of trophozoites or cysts of *E. histolytica* by external carriage. However, the viability of cysts for periods as long as 3.5 hr. after initial ingestion and later defection indicates a potential natural method of transmission.

The effect of some organic halides on the housefly, L. D. GOODHUE, W. N. SULLIVAN, and J. H. FALES. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 533-536, fig. 1).—Description is given of a small chamber devised for testing aerosols on a laboratory scale, and determinations made of the toxicities of 39 organic halides to the housefly are reported. Some of the more complex compounds such as 3-chloroacenaphthene, 2-chlorofluorene, and 9-bromophenanthrene were found to be effective at 0.01 or 0.02 lb. per 1,000 cu. ft. Some of the more volatile compounds such as methyl bromide, which do not form aerosols, are not effective when applied by this method.

Control of stablefly, or "dog fly," breeding in shore deposits of bay grasses. W. E. DOVE and S. W. SIMMONS. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 582-589, figs. 3).—A further report of studies of the stablefly, commonly known in Florida as the dog fly (E. S. R., 85, p. 708). In grass deposits along the shores of bays and sounds of northwestern Florida eggs were commonly found at the rate of 1,000 per square foot of grass and larvae at the rate of 15.4 per square foot. From material in three cages 38.5, 22.3, and 25.7 flies emerged per cubic foot of grass. Spray treatments of infested grasses with creosote in diesel oil resulted in a complete kill of eggs, larvae, and pupae, and there was no subsequent breeding of the flies in the treated grasses. The creosote was observed to remain in the grass for 18 to 30 days, or long after the time for fermentation had passed. Large-scale spray operations reduced the fly population in the treated area to less than 2 flies per animal on cattle. Predatory dragonflies identified as *Anax junius* (Drury), *Pachydiplax longipennis* (Burm.), and *Tramea lacerata* (Hagen) were observed to feed on dog flies.

Creosote oil with water for control of the stablefly, or "dog fly," in drifts of marine grasses. S. W. SIMMONS and W. E. DOVE. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 589-592).—A further report on the control of this pest (see above), which breeds extensively in tide drifts of grasses that are deposited along the shores of certain bays, inlets, and sounds of northwestern Florida. Tests with 17,750 gal. of material on 14.07 miles of grass tide drifts have shown that a mechanically prepared creosote-water emulsion can be used successfully and economically in treating bay grass for its control. Bay grass treated with creosote and bay water remains treated for 1 mo., and grass once well treated does not subsequently breed any dog flies. By eliminating the cost of diesel oil, by reducing transportation costs, and by speeding up spray operations, at least \$15,000 can be saved by the use of the creosote-water emulsion instead of creosote and diesel oil solution for a dog fly control program extending from Pensacola to Apalachicola, Fla.

Ants as probable agents in the spread of *Shigella* infections. S. D. GRIFFITHS (*Science*, 96 (1942), No. 2490, pp. 271-272).—In laboratory experiments in Puerto Rico, briefly noted, the fire ant transmitted *Shigella flexner* V from inoculated food in a container to sterile plates 24 hr. after having fed upon or traversed the infected material.

A new species of *Tiphia* from California (Hymenoptera: Tiphidae). K. V. KROMBEIN. (U. S. D. A.). (*Pan-Pacific Ent.*, 38 (1942), No. 3, pp. 139-143).—Under the name *T. shastensis* a species taken at Old Station in Shasta County is described as new, and a tablet is given separating it from *T. rugulosa* Mallach and *T. odontogaster* Viereck.

On the bionomics of *Aphidius matricariae* Hal., a braconid parasite of *Myzus persicae* Sulz., E. J. VEVAT (*Parasitology*, 34 (1942), No. 2, pp. 141-151, figs. 6).—This study relates to an internal parasite of the green peach aphid, the most efficient vector of the potato viruses leaf roll and "Y," also found parasitizing *M. circumflexus* Buckt. and *Aulacorthum solani* Kalt. "The percentage of aphids successfully parasitized increased with an increased number of strikes per host. A single female can lay up to 350 eggs, and one female successfully parasitized 309 *M. persicae*. The female parasite reaches its maximum activity during the second or third day of oviposition, and this activity has no correlation with light intensity. The disappearance of supernumerary larvae due to cannibalism has been observed. The species is arrhenotokous. Mating takes place from 2 hr. after emergence. In the progeny of early matings the females preponderated; in later matings the sex ratio was approximately 1 : 1. The parasite appears to fly under the same conditions as those generally favorable for aphids. It is generally disseminated by flight of the

adult itself and through localized movements of parasitized apterous aphids. The host is unable to reproduce if 'struck' in the third instar or earlier."

Control work on European spruce sawfly in 1939, H. B. PIERSON and R. W. NASH (*Maine Forest Serv. Bul. 12* (1940), pp. 19, pls. 2, figs. 2).

The larval Trombiculinae (Acarina: Trombididae), with descriptions of twelve new species, C. D. RADFORD (*Parasitology, 34* (1942), No. 1, pp. 55-81, figs. 106).—A catalog list of the recognized larval forms of Trombiculinae, with their known hosts, known localities of occurrence, and the number and arrangement of the dorsal setae and measurements of the 12 new species. A key to the genera of Trombiculinae, based on larval characters according to Ewing (*E. S. R.*, 80, p. 377), and pen drawings of the dorsal setae of 106 forms are included.

Lethal temperatures for *Dermacentor andersoni* Stiles and other ticks in British Columbia, G. A. MAIL (*Jour. Econ. Ent.*, 35 (1942), No. 4, pp. 562-564).—Experiments conducted have shown that unfed *D. andersoni* ticks have an average freezing point of between -10° and -14° C. except where exposed to unusually severe or protracted winters, when they appear to develop a greater resistance to freezing. Engorged ticks of several species have high freezing points, between -5° and -7° . An exception is found in the bird tick, which normally overwinters in an engorged state. The average freezing point of five engorged bird ticks was -11.3° , so this tick exhibits a greater resistance to freezing than engorged ticks of most species. Eggs of *D. andersoni* freeze at -28° and seed ticks of the same species at about -23° . Macerated eggs freeze at -8° . Unfed *Ixodes californicus* Banks freeze at -12.5° and unengorged *I. texanus* Banks freeze about -23° . When engorged these two species freeze near -7° . The lethal high temperature for unfed *D. andersoni* is between 45° and 46.5° .

Tick control with special reference to *Dermacentor andersoni* Stiles, G. A. MAIL (*Sci. Agr.*, 23 (1942), No. 1, pp. 59-67).

Note on a toxic principle in eggs of the tick *Dermacentor andersoni* Stiles, E. A. STEINHAUS (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 35, pp. 1310-1312).—In the experiments reported it was found that when large numbers of eggs of normal ticks (*D. andersoni*) were inoculated into animals characteristic toxic symptoms followed by death in 2 or 3 days usually resulted. The active principle was filtrable, resistant to drying, alcohol, and acetone, and apparently non-dialyzable.

ANIMAL PRODUCTION

General science of livestock, M. M. SMITH (*Boerne, Tex.: Boerne Star*, [1941], pp. [7]+381, [figs. 105]).—General descriptions of the breeds, management, and feeding of beef cattle, dairy cattle, sheep, goats, swine, and horses are presented.

Livestock management, J. S. COFFEY and L. E. JACKSON (*Chicago: J. B. Lippincott Co.*, [1940], pp. XI+500, [figs. 217]).—A presentation of the elements of production, management, and feeding of horses, cattle, sheep, swine, and poultry, and of disease control.

[**Animal husbandry studies by the Georgia Coastal Plain Station**]. (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul. 32* (1941), pp. 43-67, figs. 2).—Brief results are presented on seeds, management, and fertilizers for permanent and annual summer pastures such as soybeans, velvetbeans, lespedeza, kudzu, and millet, and the annual winter pastures such as oats and vetch, abuzzi rye, and oats following lespedeza, for wintering and breeding native grade and purebred polled and horned Hereford beef cows; creep feeding calves; steer feeding comparisons of velvetbeans, cottonseed meal, and peanut

meal as protein supplements for different grades of steers; the establishment of superior strains of Polled Hereford cattle; management and breeding of sows, gilts, and their suckling pigs; and hogging off oats, corn, soybeans, sunflowers, chufas, peanuts, popcorn, and sweetpotatoes.

Herds and flocks at the North Dakota Agricultural College, J. H. LONGWELL (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 1, pp. 33-35).—General description is given of the leading animals in the breeding sheep, cattle, and swine herds of the station.

[Experiments in livestock production by the Ohio Station] (*Ohio Sta. Bul.* 617 (1940), pp. 51-55, 55-58, 59, 70, fig. 1).—Reports of projects are given briefly on open-pollinated and hybrid corn for steers; the prevention of apoplexy in lambs by the inclusion of cane molasses in the ration; plant and animal proteins for pigs; removal of toxicity in cottonseed meal by iron treatment; liver meal as a protein supplement for swine; the preference of pigs for hybrid and open-pollinated corn due to lack of moisture; protein poisoning and protein levels for swine; milk in chick rations; riboflavin needed by pigs; ultraviolet lights as a source of vitamin D for chickens and turkeys; relation of humidity of holding rooms to market quality of eggs; rations and management for feeding laying hens; improved rations and management for poults; relation of ration deficiencies to hog cholera immunization; studies of digestion in steers through windows in their sides; and stage of maturity of corn for silage.

Commercial feeding stuffs—report of inspection, 1941, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul.* 459 (1942), pp. 329-422).—There are presented the guarantees and analyses of the 797 samples of commercial feeding stuffs and 42 samples of vitamin D carriers officially examined; the results of examinations of 86 specimens for poisons, by C. E. Shepard, D. C. Walden, and E. M. Bailey; and analyses of 45 samples of native seeds, grains, berries, etc.

Commercial feeds in Kentucky in 1941, J. D. TURNER, S. B. RANDLE, W. G. TERRELL, and J. J. ROSE (*Kentucky Sta. Regulat. Ser. Bul.* 31 (1942), pp. 52).—There is presented a summary of the chemical and microscopical analyses of 1,601 samples of feeds officially examined (E. S. R., 87, p. 100) with appropriate comments. Pertinent facts on the feeds sold in the State are included. The calcium, phosphorus, and manganese, as well as the vitamin A, thiamin, and riboflavin in several feeds are presented.

Inspection of commercial feedingstuffs, 1942, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 342 (1942), pp. 58).—The guaranteed and found analysis and contents of 461 samples of feeds officially inspected during the year ended June 1942 (E. S. R., 86, p. 664).

Feed control service ruling permits additional grade of cottonseed meal, F. D. FULLER and G. S. FRAPS (*Texas Sta. Cir.* 97 (1942), pp. 15).—To better comply with the lower protein content of some cottonseed a revision in the State feed law regulations was adopted to authorize a new grade of cottonseed meal and cottonseed cake containing not less than 41 percent protein and not more than 12 percent crude fiber.

The use of wheat in livestock feeding, W. L. QUAYLE (*Wyoming Sta. Bul.* 256 (1942), pp. 11).—In a series of tests conducted over 6 yr. with pigs and for a like period with lambs, wheat fed singly or in combination with barley or corn proved satisfactory for fattening animals. Considering the wheat eaten from free choice, wheat was more palatable than corn for pigs. For lambs a 50-percent mixture of wheat and corn was 88 percent as efficient as shelled corn alone and 99 percent as efficient as barley alone in producing gains. In each of the pig experiments there were 3 lots of about 10 head each fed for 55-80 days, and in the lamb experiments there were 50 head in each of 3 lots with feeding periods of 100-136 days.

Electrode potentials in laboratory silage, R. H. COMMON and W. BOLTON (*Jour. Agr. Sci. [England]*, 32 (1942), No. 3, pp. 338-348, figs. 6).—Study of the electrode potentials of ordinary and molasses silages prepared in glass jars showed that they tended to assume values of the order -0.05 to -0.1 from about the third day. The pH of the silages was in the range of 4.0-5.5. The electrodes were buried in the grass silage, which was chopped in half-inch lengths, and treated with water, molasses, sugar, hydrochloric acid, or formic acid, and packed firmly in glass jars.

The effect of heat and moisture on the feeding value of pilchard meal, W. B. LANHAM, JR., and H. W. NILSON (*U. S. Dept. Int., Fish and Wildlife Serv., Res. Rpt. 3* (1942), pp. 11-10).—The inclusion of commercial and spoiled pilchard meal in the ration of rats and chicks for 60 days and 6 and 7 weeks, respectively, showed no significant differences in the rate of gain or gain per unit of protein supplied. The meal was spoiled by holding a paste for 1 week at 50° C., and was incorporated in amounts as great as 31 percent of the ration without bad effects. A recommendation was made that pilchard meal may be successfully included in farm animal rations. The vitamin K content of the spoiled product was increased, and occurrence of some perosis in the chicks made it advisable that the rations be properly balanced with necessary minerals.

Meat products in feeding program, H. R. KRAYBILL (*Flour & Feed*, 43 (1942), No. 6, pp. 28-30).—Attention is called to the fact that meat products may provide certain deficiencies of proteins, minerals, and vitamins in rations from plant sources for nonruminants.

Studies on carotene in relation to animal nutrition, III, IV, P. A. SESHAN, and K. C. SEN (*Jour. Agr. Sci. [England]*, 32 (1942), No. 3, pp. 275-293, fig. 1). Two papers in continuation of this series (*E. S. R.*, 88, p. 232) are presented.

III. *Stability of carotene in plant material with special reference to hay making and storage* (pp. 275-285).—Carotene destruction in green plants during storage was found to result mainly from oxidation, which was accelerated by heat, light, and moisture. In ordinary combinations carotene in hays was mainly destroyed by spontaneous oxidation. Studies were made of the carotene contents of fresh, heated, and vacuum dried grasses after different storage periods. Mold growths did not seem to increase the losses.

IV. *Carotene balance experiments with cows and bullocks* (pp. 286-293). Complete carotene balance studies were conducted with four cows receiving Napier grass and berseem. Considering the 14-day tests the cows secreted milk with fair amounts of carotene, though they themselves were in negative carotene balances. With increased amounts of carotene and vitamin A in the diet the quantity of these substances in the milk was increased. In four steers which were on low carotene diets for 6 mo. there was a consistently negative carotene balance. After two doses of fresh berseem there was a rise in the retention and the blood carotene. The negative carotene balances were thought to result from a withdrawal of body reserves.

Riboflavin: Its history and properties, T. S. HAMILTON. (Univ. Ill.), (*Flour & Feed*, 43 (1942), No. 5, pp. 14, 16-18).—This is a brief survey of the research that led to the discovery and identification of riboflavin, determination of its properties, its distribution in natural products, and its differentiation from other vitamins of the B complex. The value of riboflavin in the diet of the hen as related to egg production and the requirements of turkeys for this vitamin are also considered. Sixty-two references are given.

Beef cattle for breeding purposes, J. R. DOUGLAS (*U. S. Dept. Agr., Farmers' Bul. 1916* (1942), pp. 11-18, figs. 7).—General directions for selection, management, development, and care of breeding beef cattle.

Experiments in creep-feeding beef calves, B. R. TAYLOR, O. S. WILLHAM,

and L. E. HAWKINS (*Oklahoma Sta. Bul. 262 (1942), pp. 14, figs. 5*).—From these and previous experiments (E. S. R., 79, p. 370), it is concluded that creep-fed February, March, April, and May heifer calves produced 35–50 lb. extra weight, as compared with noncreep-fed steer calves. The creep-fed calves were rather light in weight for slaughter, and they made slower and more expensive gains during a subsequent finishing period. During a 48-day feeding period the heifers made average daily gains of 2.15 lb. on ground shelled corn, soybean pellets, silage, and ground limestone. In free-choice feeding on shelled corn, whole oats, and 43 percent cottonseed meal the calves seemed able to properly balance the ration to conform with standard recommendations.

Cystic pituitary in young cattle with vitamin A deficiency, L. L. MADSEN, S. R. HALL, and H. T. CONVERSE. (U. S. D. A.). (*Jour. Nutr.*, 24 (1942), No. 1, pp. 15–24, pls. 2).—Continuing the studies of vitamin A deficiencies in cattle (E. S. R., 85, p. 233), 13 of 15 deficient animals varying in age from birth to 787 days had cystic pituitary glands. Although cystic pituitaries were rare in cattle in general, the cystics persisted in spite of adequate carotene intake following the deficiency feeding as long as over 500 days. There was little evidence of regeneration. Histological study showed the cysts to occur either in the residual lumen or within the posterior lobe, and if large enough the glandular parenchyma was replaced or constricted to suggest partial hypophysectomy. It seems probable that the injury to the pituitary glands results from the mechanism responsible for injury to the optic nerve and central nervous system.

Lucerne for fattening sheep, H. P. D. VAN WYK and W. A. VERBEEK (*Farming in So. Africa*, 17 (1942), No. 197, pp. 501–505, 526, figs. 6).—The average daily gains of several breeds of sheep grazed for 65 days on alfalfa were 0.24 lb. When one-half were grazed for a further 56 days on soybeans and velvetbeans the average daily gains were 0.198, whereas those continued on alfalfa grazing made gains of only 0.052 lb. The carcasses at the conclusion of the experiment had an attractive appearance, whereas at the commencement there was no fat cover. In the grazing test there were 35 purebred and crossbred sheep. Bloating was observed on the alfalfa pasture, but it was not serious in most cases.

The endogenous nitrogen metabolism of pigs with special reference to the maintenance protein requirement, B. A. DU TOIT and D. B. SMUTS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 16 (1941), No. 1–2, pp. 169–179, figs. 5).—The nitrogen excretion of nine pigs on a nitrogen-free diet showed a sharp drop during the first day, with a slower decrease until the sixth day after which it continued apparently constant. The data showed clearly that the equation $P = 0.81 W^{0.751}$ indicates the endogenous nitrogen production of the pig as previously shown for sheep (E. S. R., 73, p. 663). In this formula P represents the protein in grams and W the weight in kilograms.

The effect of season on the fattening of swine at various stages of growth, G. DUNLOP and A. WEST (*Empire Jour. Expt. Agr.*, 10 (1942), No. 39, pp. 161–168).—Analyses of gains and economy of gains of pigs fattened in the modern Scandinavian type of piggery showed that 3 weeks longer were required to reach bacon weight in winter and approximately 100 lb. more feed per unit of gain than were needed by summer-fed pigs. The longer period of light under spring feeding conditions with increased metabolism and its effects on the pituitary are noted. The studies were conducted with individually fed pigs in the summer and winter of 1932–34, with group feedings of 202 animals in the summers of 1926–31 and 261 in the winters of these years. It was noted that pigs required more feed per unit of gain as they increased in weight. There seemed to be a need for controlling environment during long-term nutritional experiments and in genetical studies.

Cacao by-products in pig feeding—cocoa-cake meal and de-theobrominized cocoa-cake meal as feeding-stuffs for pigs, R. BRAUDE and A. S. FOOT (*Empire Jour. Expt. Agr.*, 10 (1942), No. 39, pp. 182-188, figs. 2).—In a group feeding experiment cocoa cake meal fed at a level of 8 percent to six 65-lb. pigs per lot for 126 days produced average daily gains of 0.99 lb., but caused digestive disturbances and even death. Other similar lots made average daily gains of 1.068 and 1.003 lb. with 8 and 16 percent cocoa meal treated to remove the theobromine. In a second experiment untreated cocoa meal was successfully introduced at a 10-percent level for 50 days to pigs averaging 130 lb. The average daily gains made by this group were 1.41 lb., as compared with 1.60 lb. by a control lot. There was no evidence of liver enlargement, but the coats of the control pigs were smoother and cleaner.

Fütterungsversuche mit Birnentreckrestern an Schweinen [Feeding experiments with dried pear residue for swine], E. CRASEMANN and A. TSOHERNIAK (*Landw. Jahrb. Schweiz*, 56 (1942), No. 4, pp. 387-412; *Fr. abs.*, pp. 411-412).—The results of three experiments with 35 kg. pigs showed that dried pear residue waste might replace ground barley when proteins were supplied from meat meal, peanut meal, or skim milk, but the gains made were to a large extent fill because of the poor digestibility and large water content of the dried pear residue. In general this feed seemed effective to reduce the amount of roughages fed to the pigs, but a poor feed utilization may result. The pear residue feeding had no influence on the quality of the pork.

Pig-feeding experiment using dried *Clostridium* residue, R. BRAUDE and A. S. FOOT (*Jour. Agr. Sci. [England]*, 32 (1942), No. 3, pp. 324-329, fig. 1).—The spent liquor after distillation and drying from acetone and butyl alcohol manufacture by fermenting cane molasses with a pure culture of *Clostridium* was found to be an efficient protein for pigs. In these tests three lots of eight pigs on the control ration of cereals, meat meal, and minerals made average daily gains of 1.30 lb., whereas a comparable ration in which 9 percent dried *Clostridium* residue replaced the 10 percent meat meal in the ration made average daily gains of 1.35 lb. Another group which received 5 percent meat meal and 5 percent *Clostridium* made average daily gains of 1.24 lb. The feed required per unit of gain on the different rations was similar.

[Abstracts of papers on poultry production and breeding] (*Poultry Sci.*, 21 (1942), No. 5, pp. 465-466, 467-470, 470-479).—Abstracts of papers prepared for presentation at the 1942 cancelled meeting of the Poultry Science Association, dealing with the results of experimental work, are presented as follows: Whey Solubles as a Source of Growth Factors in Chick Rations, by E. P. Berry, C. W. Carrick, R. E. Roberts, and S. M. Hauge (p. 465), Influence of Starting Rations Upon Subsequent Growth, by R. E. Roberts and C. W. Carrick (p. 477), Distillers' Dried Solubles as a Vitamin Supplement for Chick Rations, by R. E. Synold, C. W. Carrick, R. E. Roberts, and S. M. Hauge (p. 478), and Utilization of Fat by Chickens—A Method for Determining the Absorption of Nutrients, by D. Whitson, C. W. Carrick, R. E. Roberts, and S. M. Hauge (p. 479) (all Purdue Univ.); Relation of Diet to Hatchability of Eggs Produced in Batteries and in Open-Front Houses, by H. R. Bird and J. A. Marvel (p. 465) (Univ. Md.); Crossbred Broilers and Layers Compared With Related Purebreds, by C. H. Bostian and R. S. Dearstyne (p. 465), and Improvement of General Viability in Single-Comb White Leghorns Through Breeding, by C. H. Bostian and R. S. Dearstyne (pp. 465-466) (both Univ. N. C.); The Riboflavin Requirement of Turkeys for Hatchability and Growth, by R. V. Boucher, H. Patrick, and H. C. Knandel (p. 466), Inheritance of Egg Shape, by D. R. Marble (p. 473), Inheritance in the Domestic Fowl of a Lethal Condition Affecting Both Mandibles, by D. R. Marble, E. V. Hammers, and J. A. Harper (p. 474), and The Nutritional Significance of Biotin in Chick

and Poultry Nutrition, by H. Patrick, R. V. Boucher, R. A. Dutcher, and H. C. Kandel (n. 476) (all Pa. State Col.); Nutritional and Economic Values of a Bluegrass Pasture for Laying Hens, by G. D. Buckner, W. M. Insko, Jr., and A. Harms (p. 466) (Ky. Expt. Sta.); A Study of Modified Expressions of Sex-Linked Early Feathering, by M. I. Darrow (p. 468) (Kans. State Col.); The Effect of Soybean Meal on Hatchability, by L. E. Card (p. 467), Results of Hypophysectomy in Growing Chickens, by A. Nalbandov and L. E. Card (p. 474) (Univ. Ill.); The Importance of Livability to Wartime Egg Production, by C. D. Carpenter (p. 467); The Influence of Processing by Oiling on the Interior Quality of Shell Eggs After Storage, by J. S. Carver and R. J. Evans (pp. 467-468), and The Calcium and Phosphorus Requirements of Single-Comb White Leghorn Pullets, by R. J. Evans and J. S. Carver (p. 469) (Wash. Expt. Sta.); Egg Production and Mortality of White Leghorns Fed High and Low Protein Rations, by T. B. Clark, T. D. Runnels, J. H. Rietz, and C. E. Weekley, Jr. (p. 468) (W. Va. Sta.); Sexual Activity in Guineaes Subjected to All-Night Light, by G. T. Davis and R. Penquite (pp. 468-469) (Okla. A. and M. Col.); The Experimental Induction of Ovulation in the Domestic Fowl, by R. M. Fraps and T. C. Byerly (p. 469), Growth Rate of Pullets in Relation to Production Characteristics and Viability, by C. D. Gordon (p. 470), Cow Manure as a Source of Certain Vitamins for Growing Chickens, by J. C. Hammond (p. 471), and The Composition of Turkeys of Different Breeds, by H. M. Harshaw, W. L. Kellogg, and R. R. Rector (p. 471) (all U. S. D. A.); Miscellaneous Observations on the A. O. A. C. Vitamin D Assay, by J. C. Fritz and H. R. Halloran (p. 469); Quantitative Requirement of the Hen for Pantothenic Acid, by M. B. Gillis, G. F. Heuser, and L. C. Norris (p. 470), The Comparative Viability of Unselected Leghorns and Strains Bred for Resistance or Susceptibility to the Avian-Leukosis Complex, by F. B. Hutt, J. H. Bruckner, and R. K. Cole (p. 472), The Influence of Different Daily Periods of Illumination Upon the Body Weight of White Leghorn Males, by W. F. Lamoreux (p. 473), Factors Other Than Manganese Required To Prevent Perosis in Chicks, by J. McGinnis, L. C. Norris, and G. F. Heuser (p. 474), X-Ray Radiation in Detection of Fertility in Fresh Eggs, by A. L. Romanoff (p. 477), and The Relationship Between Body Temperature and Genetic Resistance to *Salmonella pullorum* in the Fowl, by J. C. Scholes and F. B. Hutt (p. 477) (all Cornell Univ.); Study of Vitamin D From Different Sources and Its Effect on the Bone Ash Curve, by H. R. Halloran, E. V. Minasian, R. W. Collins, J. H. Hooper, and J. C. Fritz (p. 471); Further Observations on Vitamin D Stability, by J. L. Halpin, J. H. Hooper, E. H. Kramke, and J. C. Fritz (p. 471); Observations on the Shank Pigmentation of Chicks, by V. Heiman and L. W. Tighe (pp. 471-472); The Feeding of Single Massive Doses of Vitamin D to Birds, by J. H. Hooper, J. L. Halpin, and J. C. Fritz (p. 472); Strains of White Plymouth Rocks for Specific Economic Purposes, by R. G. Jaap (pp. 472-473) (Okla. Sta.); Acorns of the Willow Oak (*Quercus phellos*), A Source of Vitamin A Activity, by T. R. King and H. W. Titus (p. 473) (Va. A. and M. Col. and U. S. D. A.); Effect of Season and Heredity on the Incidence of Blood Spots, by I. M. Lerner and W. R. Smith (p. 473) (Univ. Calif.); Hormonal Induction of "Broodiness" in Roosters, by A. Nalbandov and L. E. Card (pp. 474-475); Pastures for Developing Pullets and for Laying Hens, by J. E. Parker and B. J. McSpadden (p. 475), and Seasonal Variation in Semen Production in Male Fowls, by J. E. Parker and B. J. McSpadden (p. 475) (both Univ. Tenn.); Corn Dried Distillers' By-Products in Laying Rations, by R. T. Parkhurst, C. R. Fellers, and J. W. Kuzmeski (p. 475), and The Nutritive Properties and Use of Crab Meal, by R. T. Parkhurst, J. A. Lubitz, M. S. Gutowska, and C. R. Fellers (pp. 475-476) (both Mass. State Col.); The Value of B-Y Riboflavin Supplement for Replacing Dried Skimmilk in an All-Mash Laying Ration, by P. R. Record,

R. M. Bethke, D. C. Kennard, and V. D. Chamberlin (pp. 476-477) (Ohio Sta.) : Incubation Studies With Duck Eggs, by C. W. Upp and T. G. Culton (pp. 478-479) (La. Sta.) ; and Some Physiological and Morphological Comparisons Between Standard Bronze, Broadbreasted Bronze, and U. S. D. A. Small-Type Turkeys, by A. G. Williams (p. 479) (Ohio State Univ.).

Nutritional experiments with chickens, A. J. MacDONALD (*Indian Jour. Vet. Sci. and Anim. Husb.*, 11 (1941), No. 3, pp. 207-238).—A mixed cereal ration supplemented with green feed and calcium fed to White Leghorn, Rhode Island Red, and desi chicks to 24 weeks of age gave poor growth, excessive mortality, and poor feed utilization. When this ration was supplemented with skim milk as a drink it proved satisfactory. The best results were obtained when milk alone instead of milk and water were both provided up to 6 weeks of age. Soybean meal as a supplement to the cereal ration improved growth and egg production, but the results were not as good as when skim milk was supplied. This substance was especially important up to 6 weeks of age. The conclusions are based on the results of five experiments with about 100-200 chicks in each.

Soybean meal in poultry feed, C. W. CARRICK. (*Ind. Expt. Sta.*). (*Flour & Feed*, 43 (1942), No. 6, pp. 14-15).—In studies with young chicks (E. S. R., 87, p. 697) soybean meal properly processed was found to supply a high quality of protein for supplementing corn, but it and corn were deficient in several mineral and vitamin factors which may be corrected by other common products or pasture.

Observations on the value of whale-meat meal as a constituent of chick diets, with a note on the influence of added protein on the efficiency of utilization of the gross energy of a ration, E. T. HAYMAN (*Jour. Agr. Sci. [England]*, 32 (1942), No. 2, pp. 179-193).—Whale meat vacuum-dried at 80° C. and a sample dried at 145° were shown, when added to a cereal ration for chicks, to have high biological values as ascertained by slaughter tests. The nutritive values of the whale meat were less affected by the lower temperature of drying, since the average weights of 26 chicks fed for 5 weeks with the vacuum-dried meal on a ration with a 17-percent protein level were 466.8 gm. as contrasted with 406.2 gm. for a group in which whale meal dried at 145° was substituted. Outbreaks of feather picking occurred in the whale meal groups for the same reasons as previously noted for gizzard erosion (E. S. R., 87, p. 262). The details and weights of the individual birds at 5-week intervals and the composition of the carcasses of individual birds are presented.

The value of dairy products in nutrition, I, II (*Poultry Sci.*, 21 (1942), No. 5, pp. 387-406).—Two papers are presented.

I. Basal rations for chick assays, R. A. Sullivan, E. Reeves, E. Bloom, and W. Rateike (pp. 387-395).—A basal ration of cereal products with casein and lactose was found to promote growth to an average weight of 232 gm. in Single-Comb White Leghorn cockerels at 8 weeks of age. When supplemented with filtrate factors, liver residue, factor W, and riboflavin, growth to 8 weeks was improved. With the combination of all these supplements the average 8 weeks' weight was 678 gm. A mixture of dairy products consisting of dried buttermilk, dried skim milk, and dried whey gave equal results, but this was further improved by alfalfa meal, liver extracts, and liver residue to produce 8 weeks' weights of over 700 gm. In a 6-week experiment 5 and 10 percent peanut meal as a supplement produced increased growth. In a further experiment a basal ration including 10 percent peanut meal was used in testing supplements of dried whey, yeast, and buttermilk. Each of these showed a definite improvement, but the birds did not feather as rapidly or smoothly. Both yeast and buttermilk appeared to contain factors in addition to riboflavin. Several combinations in basal rations were compared with chicks to 8 weeks of age.

In these tests more than 10 percent peanut meal without reducing the oat products and including alfalfa extract was tested. As a result a ration consisting of 20 percent oatmeal, corn meal 10, wheat bran 10, wheat middlings 10, ground oats 10, peanut meal 15, purified casein 10, lactose 5, salt mix 5, and oils (soybean oil, alfalfa extract, and cod-liver oil) 5 percent, was employed. Markedly subnormal growth was produced on the basal ration alone, but when supplemented with whey growth equal to that on a practical ration was attained.

II. Growth factors for chicks, R. A. SULLIVAN, E. BLOOM, E. REEVES, and W. RATELKE (pp. 396-406).—In experiments on growth of Single-Comb White Leghorn day-old chicks to 5-8 weeks of age, it was shown that dairy products contained in addition to riboflavin growth factors similar to a crude preparation of the W factor needed in poultry mash. The presence in dairy products of a factor in yeast was noted as a possible explanation of the extra growth obtained with the dairy products. Other experiments indicated that milk may contain an as yet unidentified member of the filtrate fraction. Dairy products seemed to be deficient in choline. The studies were conducted with chicks receiving heated and unheated rations compounded as in the previous investigation, and with various supplements of dairy products, pantothenic acid, the W factor, and yeast and liver extracts and residues.

The effects of feed supplements in the economy and efficiency of poultry feeding (*Rhode Island Sta. Rpt.* [1941], pp. 31-32).—Results are briefly reported with six pens of pullets of the effects of buttermilk, cereal grasses, and grass juice on the hatchability, percentage of thick albumin, and yolk color of the eggs produced.

A liver concentrate as a source of unrecognized vitamins required by the chick, L. R. RICHARDSON, A. G. HOGAN, and R. J. KARRASCH. (Mo. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 1, pp. 65-72, fig. 1).—Chicks on a basal ration containing the known vitamins grew slowly and developed perosis (E. S. R., 85, p. 674), but in further studies it was found that fuller's earth at a pH of 1.0 adsorbed unrecognized substances from a water extraction of liver and normal growth was promoted. Additions of water extract of the liver plus 0.1 percent biotin or 1 percent fuller's earth eluate furnished the needed supplement to the basal ration for groups of 10-22 chicks of each sex up to 6 weeks of age.

Sunlight lamps for laying hens, F. E. MUSSFHL and F. D. YUNG (*Nebraska Sta. Bul.* 344 (1942), pp. 8, figs. 3).—Single-Comb White Leghorn hens were kept in good condition with comparable hatchability and egg production by furnishing daily 100 A. O. A. C. units of vitamin D per hen from fish oil or 2 hours' daily exposure of lots of 125 hens to S-1 or S-4 lamps placed 60 in. from the floor during the interval October 15 to March 15.

Black rot in fresh shell eggs, A. R. WINTER (Ohio State Univ.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 9, pp. 506-509, 520).—Bacterial cultures of black rot eggs incubated at room temperature showed bacteria to be present in 103 of 109 eggs cultured, while molds were present in the other 6 eggs. It was thought likely that these organisms had come from fecal material, soil, and water. It was assumed that the source of infection was dirt on the shell or water used in cleaning the eggs, and the black rot condition was prevented by producing clean eggs. The genera and species of the bacteria found and the success in reculturing in fresh eggs are indicated.

Squab raising, A. R. LEE and S. K. HAYNES (*U. S. Dept. Agr., Farmers' Bul.* 684, rev. (1942), pp. [2]+20, figs. 19).—A revision of the publication previously noted (E. S. R., 33, p. 872).

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and milk products by the Ohio Station] (*Ohio Sta. Bul.* 617 (1940), pp. 45-47, 47-49, 50, 70, fig. 1).—Results of investigations are briefly reported on feeds needed per unit of milk produced up to 350 lb. of fat per year; lowering the grain requirements of dairy cattle by hay and pasture feeding; ensiling carrots for milk production; wheat and alfalfa silage compared with alfalfa hay for milk production; ground corn as a preservative for legume silage; irradiation of cows did not increase milk production but increased vitamin D in the milk; no difference in effectiveness on rickets of vitamin D from soft curd and homogenized milk; loss of vitamin C in milk prevented by cold temperature; carotene content of roughages reflected in milk; damage to reproductive organs from vitamin A deficiency; vitamin D content of milks; and increased use of roughages for milk production.

[Pastures and feeding for dairy cattle by the Georgia Coastal Plain Station]. (Partly coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul.* 32 (1941), pp. 67-69).—Permanent and annual pasture tests and grain feeding for dairy cattle are briefly presented.

Korean lespedeza seed as a protein supplement for milk production, H. A. HERMAN and A. C. RAGSDALE (*Missouri Sta. Bul.* 451 (1942), pp. 7).—In two reversal feeding trials of 40 days' duration each with 2 groups of 10 dairy cows, 188 lb. of Korean lespedeza seed satisfactorily replaced 75 lb. each of cottonseed meal and soybean meal for milk production and the maintenance of weight. The lespedeza-fed groups produced an average of 29.39 lb. of fat-corrected milk per day, while those on the normal ration produced an average of 29.48 lb. Approximately equal amounts of grain, silage, and hay were consumed by the 2 groups. Digestion trials with 2 Holstein-Friesian heifers indicated that the proteins of ground Korean lespedeza seed were equal to those of cottonseed meal and soybean meal.

War emergency plans for raising calves and heifers, W. E. KRAUSS (*Ohio Sta. Bimo. Bul.* 218 (1942), pp. 149-155).—The nutritive requirements of calves are reviewed, with suggestions as to how essentials may be supplied with emergency feeds.

The cow's udder, W. E. PETERSEN (*Minnesota Sta. Bul.* 361 (1942), pp. 16, figs. 10).—The cow's udder is considered as to its growth, development, evolution, external and internal structure, and circulation, and physiological functioning of milk secretion and milking.

[Investigations of dairy bacteriology] (*Jour. Bact.*, 44 (1942), No. 2, pp. 255-256).—The results of the following papers are abstracted: Observations on Bacteriological Condition of Creamery Water Supplies, by H. F. Long and R. T. Corley (Iowa State Col.), and Influence of Growth at Low Temperature on Heat Resistance of *Lactobacillus bulgaricus*, by J. G. Voss and W. C. Frazier (Univ. Wis.).

Bacteriological control of milk quality, L. LITTLE (*Jour. Milk Technol.*, 5 (1942), No. 4, pp. 221-226).—Three samples of 10 cc. each were taken from 1,200 samples of milk collected at monthly intervals and tested by the methylene blue reductase test in comparison with the oval tube counts of Myers and Pence (*E. S. R.*, 85, p. 661). When testing the milk with 5,000-20,000 and over 20,000 bacteria per cubic centimeter approximately the same results were obtained, but there was an unbelievable difference between the grades of milk. The careless handling of utensils and milking machines was considered responsible for the higher counts after pasteurization, but in many cases raw milk with low bacterial counts was responsible for high counts after pasteurization because of the presence of thermoduric organisms. Heat-resisting bacteria

were poor reducers for the methylene blue and resazurin tests, and therefore their presence with other bacteria may assist in their identification with unsanitary production. The oval tube technic has proven its worth for replacing the standard plate count in routine control studies.

The plate count and methylene-blue reduction test applied to milk, H. BARKWORTH, J. O. IRWIN, and A. T. R. MATTICK (*Jour. Dairy Res. [London]*, 12 (1941), No. 3, pp. 265-314, fig. 1).—Comparison of the plate counts of samples of milk showed this method to be slightly less discriminatory than the methylene-blue reduction test observed every 5 min. but more sensitive than the methylene-blue test observed every half hour. Miscellaneous, special, and inspected milk samples were investigated singly and in duplicate after different periods of treatment and when the plate counts were made on different kinds of media and for samples collected and stored for different intervals. The agreement between the methylene-blue test and the plate count was better than 80 percent. Reduction time for a given plate count was affected by season (winter or summer), time of milking (morning or evening), and by age of the sample. Comparable results were obtained from the plate count, the methylene-blue test, and the fat test (Gerber) when the standard technic was rigorously adhered to. Comparable results of keeping quality as ascertained by the methylene-blue test at 15.5° C. were obtained between specific laboratories but not for general application. Minor changes in production did not affect plate count or reduction time, but higher correlations were found in summer than in winter milk. Addenda including statistical analyses of the different methods are included. Because of the ease of conducting and repeating, the methylene-blue reduction test is preferred. The studies were based on results obtained at four different laboratories.

Dye reduction in milk related to Eh, pH and dissolved gases, J. M. FRAYER (*Vermont Sta. Bul.* 498 (1942), pp. 34, figs. 15).—Further study of dye reduction in milk (E. S. R., 83, p. 816) led to the tentative conclusion that the high sensitivity of the resazurin dye reaction and the possible occurrence of color changes resulting from factors other than those attributable to a high bacterial content and physiological abnormalities indicated that the methylene-blue test for milk quality is likely to give better results for the average milk plant operator than known modifications of the resazurin test, especially without complete microscopic confirmation. Low count milk in bright sunlight acted the same to resazurin additions as poor quality milk. There was no relation between the moment of dye reduction and the pH. The Eh level at the resazurin pink stage was more variable than that occurring when the dye was fully reduced. In the interpretation of dye reduction tests it cannot be assumed that (1) all cell types in milk have the same influence on dye reduction and dissolved gas depletion; (2) that oxygen is the only gas involved in the resazurin reduction; and (3) that all resazurin color modifications result from abnormalities deleterious to quality. The bacterial growth phase at the moment of the test had much to do with the shape of the curve produced, and temperature was also a factor. Studies were made on divided samples of milk having different acidities, gas contents, cultures present, etc., in establishing the comparative time:potential curves. The studies made included colostrum, reconstituted milk, and milk from animals with mastitis.

The freezing-point of milk.—I, The freezing-point and solids-not-fat content of the milk of individual cows throughout a period of lactation, R. ASCHAFFENBURG and P. L. TEMPLE (*Jour. Dairy Res. [London]*, 12 (1941), No. 3, pp. 315-321, figs. 2).—The relative constancy of the freezing point and solids-not-fat content of the milk from three Shorthorn cows over a period of 6 mo. was confirmed. No influence of state of lactation on the freezing point depres-

sion was observed, but ample supplies of spring pasture lowered the freezing point. Extremes were not associated with different stages of the oestrous cycle.

Thermoduric organisms in relation to high-temperature short-time pasteurization, F. W. FABIAN. (Mich. State Col.). (*Jour. Milk Technol.*, 5 (1942), No. 4, pp. 237-242).—Four groups of thermoduric bacteria were commonly found in milk which has survived pasteurization, namely, micrococci, streptococci, sarcinae, and bacilli. The cow's udder and improperly cleaned utensils were the principal sources of thermoduric bacteria. The control of thermoduric bacteria is considered to be a producers' problem, while the control of thermophilic bacteria is a dealers' problem. There is included a bibliography of 31 references on thermoduric bacteria and milk pasteurization.

The influence of ammonia on the development of rancidity in milk, C. H. CASTELL (*Jour. Milk Technol.*, 5 (1942), No. 4, pp. 195-201, fig. 1).—Small amounts of ammonia were found to lower the surface tension of milk and accelerate the development of rancid flavors at 5° C. It seems doubtful if the concentration of ammonia in the atmosphere of the barn where cows are being milked would ever be a major factor causing rancidity to develop in milk or cream.

The "cream top" type bottle for laboratory sampling of homogenized milk, J. LEVINE and R. H. FEINGOLD (*Jour. Milk Technol.*, 5 (1942), No. 4, pp. 202-203, figs. 2).—Methods for sampling homogenized milk to comply with the regulations are presented.

Problems incident to the production and use of homogenized milk, G. M. TROUT (Mich. Expt. Sta.). (*Jour. Milk Technol.*, 5 (1942), No. 4, pp. 233-236).—A general discussion of problems arising from and the control of homogenization of milk.

The rheology of butter, I-III, R. M. DOLBY (*Jour. Dairy Res. [London]*, 12 (1941), No. 3, pp. 329-349, figs. 7).—Three studies in this series are briefly presented.

I. *Methods of measuring the hardness of butter* (pp. 329-336).—The splitting or crumbling of butter samples caused a lack of reproducibility in the measures of hardness of butter by the Scott-Blair apparatus (E. S. R., 81, p. 102). An improved method has been developed, based on resistance to different sized wires drawn through butter at different temperatures.

II. *The relation between rate of shear and shearing stress. The effect of temperature and of reworking on hardness and on structural viscosity* (pp. 337-343).—A practical measure for hardness of butter was furnished by the ratio of the rate of shear to the load. The viscosity of the butter decreased rapidly as the rate of shear increased at temperatures of 6°-18° C.

III. *The effect of variation in buttermaking conditions on the hardness of the butter* (pp. 344-349).—Cream rapidly cooled after pasteurization made a harder butter than cream cooled less rapidly. The hardness of the butter was not influenced by the type of pasteurizer, temperature of cream during holding and churning, temperature of the wash water, and amount of working.

A simplification of the Scott Blair-Coppen test for the pitching consistency of cheese curd, G. W. and M. F. SCOTT BLAIR (*Jour. Dairy Res. [London]*, 12 (1941), No. 3, pp. 322-328, fig. 1).—Extensive study of the pitching test (E. S. R., 85, p. 813) showed that much less accuracy in timing is required to give satisfactory results in Cheddar cheese manufacture than was formerly thought necessary.

The effect of dextrose and sucrose sugars upon the properties of ice cream, W. H. E. REID, K. R. MINERT, and C. W. DECKER. (Univ. Mo.). (*Ice Cream Rev.*, 16 (1942), No. 2, pp. 18-21, 46, 50, figs. 5).—Batches of ice cream made up with 10-15 percent sucrose and 5-0 percent dextrose, respectively, showed that the

replacement of sucrose had no significant effect on the acidity, pH, viscosity, or specific gravity of the mix, but ice cream frozen in batch freezers gave a somewhat colder sensation than ice cream frozen in continuous freezers. Macroscopic study of the crystals showed ice cream from the continuous freezer to have a finer and closer texture than ice cream from batch freezers. Ice creams containing dextrose were slightly less sweet than samples made up entirely of sucrose. The resistance of samples of the ice cream melting-down temperatures was related to the dextrose present. Differences in the freezing point would in part explain the differences in the stability of ice creams containing dextrose and sucrose. Smaller ice crystals were present in samples drawn from the continuous freezer at 22° F. which contained sucrose than were present in dextrose samples. The crystalline structure was affected by the temperature at which ice cream was drawn from the freezer. The properties of the ice creams were not appreciably affected by variations in the freezing procedure in different types of freezers.

A method for saving sugar in ice cream manufacture, A. LEIGHTON and O. E. WILLIAMS. (U. S. D. S.). (*Ice Cream Rev.*, 26 (1942), No. 2, pp. 14-15, 50, 42, 44, fig. 1).—Study of methods of saving sugar in ice cream manufacture showed that less than 13 percent did not produce a sufficiently sweet product. Four mixes containing 13 percent with varying quantities of fat and solids-not-fat showed the importance of considering higher overruns to offset increased costs and employing high concentrations of sugar in the water of the mix. This allows the substitution of milk solids for sugar economically feasible. The substitution of other sweetening products for the sucrose is also proposed.

Manual for dairy manufacturing short courses (*Ann Arbor, Mich.: Edwards Bros., 1940, pp. V+266, figs. 3*).—This manual, prepared by the department of dairy manufactures of the Pennsylvania State College, contains much useful information on the testing, manufacturing, and control of dairy products.

VETERINARY MEDICINE

Approved laboratory technic: Clinical pathological, bacteriological, mycological, parasitological, serological, biochemical, and histological, J. A. KOLMER and F. BOERNER (*New York and London: D. Appleton-Century Co., [1941], 3. ed., pp. XXVII+921, pls. 12, figs. [381]*).—This work, prepared in collaboration with 28 specialists and including laboratory methods to be used by veterinarians, is presented in five sections. Section 1 (pp. 1-51), which consists of 3 chapters, relates to general laboratory methods; section 2 (pp. 52-315), of 11 chapters, to clinical pathological methods; section 3 (pp. 316-579), of 11 chapters, to bacteriological methods; section 4 (pp. 580-688), of 6 chapters, to serological methods; and section 5 (pp. 689-841), of 7 chapters, to chemical methods. Additional methods are given in an appendix (pp. 843-870).

Veterinary surgery notes, E. R. FRANK (*Minneapolis, Minn.: Burgess Pub. Co., 1942, rev., pp. [2]+258, figs. 183*).

[Work in animal pathology and parasitology by the Ohio Station] (*Ohio Sta. Bul. 617* (1940), pp. 47, 58-59, 71-72).—The work of the year reported (E. S. R., 83, p. 540) relates to the failure of artificial sunlight to control Bang's disease, the shedding of mastitis germs by apparently normal cows, tetrachloroethylene or a combination copper sulfate-nicotine sulfate the best control for gastrointestinal parasites of sheep, and the rotation of sheep and cattle on pasture as an aid in parasite control.

[Work with animal diseases by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1941], pp. 32-34*).—The work of the year (E. S. R., 85, p. 815) reported

upon relates again to infectious coryza (*H[emophilus] gallinarum*) infection, infectious bronchitis, and autopsy examinations of fowl and small animals.

Agricultural research in Great Britain—animal diseases (In *Agricultural Research in Great Britain*. London: Agr. Res. Council, 1942, pp. 64-74).—A brief presentation of investigational work under way with diseases and parasites of livestock in Great Britain.

[Contributions on endoparasites] (*Helminthol. Soc. Wash. Proc.*, 9 (1942), No. 2, pp. 56-63, 65-74, figs. 3).—Contributions presented include the following: Early Natural Infections of Suckling Pigs With Helminth Parasites, by J. S. Andrews and J. W. Connelly (pp. 56-57), Observations on Fatalities in Sheep Caused Primarily by Heavy Natural Infections With the Stomach Worm *Haemonchus contortus*, by K. C. Kates (pp. 57-60), On the Survival of the Preparasitic Stages of the Cattle Lungworm on Pastures, by D. A. Porter (pp. 60-62), Death of Pigs Associated With the Presence in the Heart Tissue of Larvae of *Strongyloides ransomi*, by L. A. Spindler and C. H. Hill (pp. 62-63), New Host-Parasite Records (p. 65) and A New Nematode, *Skrjabinema parva* (Nematoda: Oxyuroidea), From Deer (pp. 66-68), both by G. Dikmans, The Occurrence of *Bartonella* in Cases of Anaplasmosis and in Apparently Normal Cattle, by J. C. Lotze and G. W. Bowman (pp. 71-72), Earthworms as Possible Intermediate Hosts of *Capillaria caudinflata* of the Chicken and Turkey, by R. W. Allen and E. E. Wehr (pp. 72-73), and The Occurrence in the United States of the Turkey Ascarid *Ascaridia dissimilis* and Observations on Its Life History, by E. Wehr (pp. 73-74) (all U. S. D. A.); and Inoculations With *Trichomonas foetus* (Protozoa) in White Rats and Mice, by B. B. Morgan (pp. 68-71) (Univ. Wis.).

Studies on brucellosis in Mexico: Comparative study of various diagnostic tests and classification of the isolated bacteria, M. RUIZ CASTANEDA, R. TOVAR, and R. VELEZ (*Jour. Infect. Diseases*, 70 (1942), No. 2, pp. 97-102, figs. 2).—The classification of 150 strains of *Brucella* in 200 patients in Mexico revealed 143 as *B. melitensis*, 5 *B. abortus*, and 2 *B. suis*.

The Brucella complement fixation reaction, B. WISE and H. W. CRAIG (*Jour. Infect. Diseases*, 70 (1942), No. 2, pp. 147-151).—It is concluded that in general the *Brucella* complement fixation reaction possesses no advantage over the more easily performed agglutination test. However, because the appearance of complement-fixing antibodies frequently precedes that of agglutinins, complement fixation may be occasionally useful for the diagnosis of acute brucellosis. *Brucella* polysaccharide, brucellin, and brucellergin have been found to provoke the appearance of complement-fixing antibodies when injected intravenously into rabbits and intracutaneously into humans.

Studies on the transmission of lymphocytic choriomeningitis virus by arthropods, A. MILZER (*Jour. Infect. Diseases*, 70 (1942), No. 2, pp. 152-172, figs. 3).—In work with the guinea pig the transmission of lymphocytic choriomeningitis by the yellow-fever mosquito occurred by bite when the mosquitoes were incubated at various constant temperatures ranging from 26° to 34° C., while no virus was detected in mosquitoes incubated at 25° and lower or at 37°. Best results in transmission were obtained with mosquitoes kept at 28°, 30°, and 32°. Successful transmission occurred at periods of time varying from 7 to 38 days following the infective blood meal. Six attempts to transmit lymphocytic choriomeningitis from infected to normal guinea pigs by the northern house mosquito and *Aedes albopictus* incubated at room temperature (22°-25°) at intervals ranging from 5 to 15 days were unsuccessful. Successful transmission of lymphocytic choriomeningitis from infected to normal guinea pigs by means of bedbugs incubated at 22°-25° was obtained in 11 of 18 attempts at intervals of time ranging from 10 min. to 85 days. In one instance transmission of the virus from an infected mouse to a normal guinea pig by bedbugs after 16 days

had clasped was demonstrated. Both male and female bedbugs as well as first-stage larvae were able to transmit the virus. Evidence was presented showing that bedbugs are unable to transmit infection by bite alone and that transmission usually occurs only when the bugs are allowed to defecate on the bitten area. Virus was detected in dried feces collected from infected bedbugs as long as 85 days from the time of infection. Infection was also transmitted by rubbing infected bug feces on the lightly scarified skin of normal guinea pigs. One experiment was made showing that virus may persist through molting from first to second larval stages, but not when the same bedbug lot molted to the third and fourth larval stages. Transovarial transmission of the virus to subsequent larvae was demonstrated in one instance, but two attempts to repeat this experiment were unsuccessful. Attempts to transmit infection by forcing mice and guinea pigs to swallow living, infected bedbugs in gelatin capsules failed. One successful transmission experiment was done under conditions which approximated those occurring in nature.

One attempt to transmit lymphocytic choriomeningitis from an infected to a normal rhesus monkey by uncontrolled feeding of rhesus monkey lice (*Eupodiscinus longiceps* (Paiget)) failed. The virus, however, was shown to survive for at least 24 hr. in infected monkey lice incubated at 22°-25°. Four attempts to transmit lymphocytic choriomeningitis by uncontrolled feeding of infected mites (*Atricholaelaps glasgowi* (Ewing)) incubated at room temperature on normal mice at intervals ranging from a few minutes to 25 days gave negative results. The virus, however, was shown to survive for at least 25 days in infected mites. Successful transmission was obtained by forcing mice and guinea pigs to swallow living infected mites in gelatin capsules.

Encephalomyelitis in Saskatchewan, 1941 (preliminary report), R. O. DAVISON (*Canad. Pub. Health Jour.*, 33 (1942), No. 8, pp. 388-398, figs. 2).—An account of an epidemic of this disease in man in the summer of 1941 due to the western type.

Western equine encephalitis, G. D. W. CAMERON (*Canad. Pub. Health Jour.* 33 (1942), No. 8, pp. 383-387).—A discussion of this disease, particularly as it applies to Canada.

Mosquitoes and encephalitis in the Yakima Valley, Washington, I-V (*Jour. Infect. Diseases*, 70 (1942), No. 3, pp. 263-283, figs. 4).—This contribution appears in five parts.

I. *Arthropods tested and recovery of western equine and St. Louis viruses from Culex tarsalis Coquillett*, W. M. HAMMON, W. C. REEVES, B. BROOKMAN, and E. M. IZUMI (pp. 263-266) (Univ. Calif., Wash. State Col., U. S. D. A., et al.).—During a 4-mo. period in the summer of 1941, 15,610 living arthropods, of which 12,466 were mosquitoes, were collected, frozen, and inoculated into laboratory animals for the purpose of virus isolation. From *C. tarsalis* three strains of St. Louis encephalitis virus and five strains of western equine encephalomyelitis virus were isolated. No virus was isolated from other species of mosquitoes, though the samples of *Aedes*, *Theobaldia*, and *Anopheles* were of such order that, had infection rates been equal to those of *Culex*, isolations would have been probable. During the period of 41 days when all infected mosquitoes were caught at least 1 of every 386 *C. tarsalis* was infected and at least 1 of every 813 of all mosquitoes caught. Final identification of viruses was by neutralization tests with specific hyperimmune serums.

II. *Methods for collecting arthropods and for isolating western equine and St. Louis viruses*, W. M. HAMMON, W. C. REEVES, and E. M. IZUMI (pp. 267-272) (Univ. Calif., Wash. State Col., U. S. D. A., et al.).—Methods for obtaining

suitable live specimens of certain arthropods for virus isolation, together with methods of handling for identification, are described.

III. Feeding habits of *Culex tarsalis* Coq., a mosquito host of the viruses of western equine and St. Louis encephalitis. F. B. Bang and W. C. Reeves (pp. 273-274) (Univ. Calif., Wash. State Col., U. S. D. A., et al.).—Through precipitin tests it was demonstrated that *C. tarsalis* feeds in nature on cows, horses, man, pigs, dogs, chickens (other birds?), and sheep. It is pointed out that if this species is demonstrated to be an efficient vector of western equine and St. Louis viruses of encephalitis this widespread feeding makes it possible for it to spread the infection among many mammals and birds.

IV. A trap for collecting live mosquitoes. W. C. Reeves and W. M. Hammon (pp. 275-277) (Univ. Calif.).—Description and illustrations are given of a trap that was designed for the collection of live mosquitoes during an extensive field survey.

V. Summary of case against *Culex tarsalis* Coquillett as a vector of the St. Louis and western equine viruses. W. M. Hammon, W. C. Reeves, B. Brookman, and C. M. Gjullin (pp. 278-283) (Univ. Calif., Wash. State Col., U. S. D. A., et al.).—The evidence here reviewed indicates that *C. tarsalis* is the most important vector of western equine and St. Louis encephalitis viruses in the Yakima Valley. Its possible role elsewhere will have to be judged on the basis of local observations. A summary of experimental arthropod transmission of the western type of the equine encephalomyelitis virus given in tabular form reveals (1) its transmission by nine species of mosquitoes (*Aedes* spp.), the bloodsucking conenose, and a tick (*Dermacentor andersoni*) and (2) nontransmission by six other mosquitoes (*Aedes* three, *Anopheles* two, *Culex* one), a reduviid bug (*Triatoma rubida* Uhler), three flies (*Lyperosia*, *Tabanus*, *Stomoxys*), the cat flea, and *Diphanus montanus*.

Studies on eastern equine encephalomyelitis.—VI. Facilitation of infection in the mouse. L. S. KING (*Jour. Expt. Med.*, 76 (1942), No. 4, pp. 325-334, figs. 2).—In continuation of these studies (*E. S. R.*, 82, p. 683) 50 percent glycerine injected intraperitoneally, intramuscularly, or intravenously was found to enhance greatly the activity of equine encephalomyelitis virus injected intramuscularly, increasing its virulence up to a hundredfold. The same effect is produced by very concentrated sodium chloride. The result appears due to dehydration of the nervous system, suddenly produced. Gradual withdrawal of body fluids, produced by depriving animals of drinking water, results in sharp concentration of the blood, equal to that produced by glycerine or salt, but such deprivation of water alone does not result in significant dehydration of the brain nor does it have any effect on virus action. The facilitation effect is not produced by drastic procedures involving shifts of electrolytes without loss of total water from the brain. Glycerine has no facilitating action when the virus is administered intranasally or intraocularly, suggesting a fundamental difference in pathogenesis between these routes and the intramuscular.

Search for sources and carriers of equine encephalomyelitis virus. R. GWATKIN and I. W. MOYNIHAN (*Canad. Jour. Res.*, 20 (1942), No. 11, Sect. D, pp. 321-337).—Examinations were made of the brains of many fowl and mammals and the spleens of several others, also many insects and ticks, but only two ground squirrels were found infected with the equine encephalomyelitis virus. This is said to be the second occasion on which results have suggested the presence of virus in a very small amount in ground squirrel brains (*E. S. R.*, 35, p. 824).

Induced resistance of the central nervous system to experimental infection with equine encephalomyelitis virus.—I. Neutralizing antibody in the central nervous system in relation to cerebral resistance. I. M. MORGAN, R. W.

SOHLESINGER, and P. K. OLITSKY (*Jour. Expt. Med.*, 76 (1942), No. 4, pp. 357-369, figs. 2).—Neutralizing antibody to equine encephalomyelitis virus was found in the spinal fluid of rabbits sufficiently vaccinated with active or formalin-inactivated virus. Antibody was specific for the western or for the eastern virus. Neutralizing capacity of spinal fluid was equivalent to that of a 1:300 dilution of serum of the same animal and was of the same order of magnitude as that of perfused brain of a vaccinated animal. Vaccinated rabbits which showed antibody in the spinal fluid resisted intracerebral or intracisternal injection of active virus. This immunity was specific, i. e., there was no cross-reaction between the eastern and western virus after vaccination with formalin-inactivated virus. On the other hand, lack of antibody in the spinal fluid, even when antibody was demonstrable in the undiluted serum, was associated with lack of cerebral resistance.

The starling (*Sturnus vulgaris* L.) and foot-and-mouth disease, W. S. BULLOUGH (*Roy. Soc. [London], Proc., Ser. B*, 131 (1942), No. 862, pp. 1-12, figs. 9).—Circumstantial evidence is presented which suggests the possibility of a connection between the starling and the occurrence of unexplained outbreaks of foot-and-mouth disease. The starling is singled out as the one common species of bird in the British Isles which is intimately connected with cattle, and it is shown that striking correlations exist between the migrations, movements, and distribution of this species and the geographical and monthly incidence of the disease. An attempt is also made to analyze the position of foot-and-mouth disease in Finland, Sweden, and Denmark. In the case of Sweden, where the starling is absent in autumn and winter, a graph is obtained which is the reverse of that for the British Isles where, in autumn and winter, the starling is most numerous.

Starling movements and the spread of foot-and-mouth disease, W. S. BULLOUGH (*Nature [London]*, 149 (1942), No. 3790, pp. 683-685, figs. 3).—This contribution is based upon the study above noted.

Experimental infection of the chick embryo with the virus of pseudorabies, F. B. BANG (*Jour. Expt. Med.*, 76 (1942), No. 3, pp. 263-270, pls. 2).—The chick embryo responds to experimental infection with the virus of pseudorabies with a disease pattern simulating the natural infection. Virus lesions of the membrane are followed by infection of all tissues of the central nervous system.

Studies on the *Salmonella* group: Methods of isolation and pathogenicity of strains occurring in the intestines of chickens, W. L. MAILMAN, J. F. RYFF, and E. MATTHEWS. (Mich. Expt. Sta.). (*Jour. Infect. Diseases*, 70 (1942), No. 3, pp. 253-262).—Methods used for the isolation of *Salmonella* from man were found by the authors to be applicable to avian intestinal contents. A combined method using tetrathionate broth as an enrichment medium and either MacConkey's agar or bismuth sulfite agar as differential media is described. The need of a selective medium to isolate *Salmonella* from intestinal contents and feces is apparent from the results obtained where organisms of the *Salmonella* and *Escherichia* groups were mixed. The latter obscures or overgrows the *Salmonella* organisms when no inhibitory agent is present. The following organisms were isolated from the intestinal contents or feces of chickens: *S. aberdeen*, *S. give*, *S. californica*, *S. worthington*, *S. oranienburg*, *S. paratyphi* B, *S. new brunswick*, *S. urbana*, *S. hvittingfoss*, *S. muenchen*, and *S. pullorum*. Of the species isolated, *S. californica*, *S. urbana*, *S. aberdeen*, *S. give*, and *S. hvittingfoss* have not previously been reported from chickens. A total of 204 birds were examined in this study using the recommended technic and media for isolation of *Salmonella*. From the intestinal tracts of 48 of these, 72 strains of organisms were isolated which were found to belong to the *Salmonella* group. Twenty-two birds carried

Salmonella other than *S. pullorum*; 35 of the strains were *S. pullorum*. None of the salmonellas isolated from chicken intestinal contents or feces showed any pathogenicity for monkeys (*Macacus rhesus*) when fed in excessive doses.

A group of coliform bacilli serologically related to the genus *Salmonella*, C. A. PELUFFO, P. R. EDWARDS, and D. W. BRUNER. (Ky. Expt. Sta.). (*Jour. Infect. Diseases*, 70 (1942), No. 2, pp. 185-192).—Description is given of a group of seven paracolon strains which possess flagellar antigens closely related to those of *S. dusseldorf* and *S. cerro*. The seven strains, the majority of which were isolated from diseased animals, composed five serologic types whose antigenic composition was determined. All the bacilli fermented lactose slowly and liquefied gelatin. They are Enterobacteriaceae whose biochemical properties do not coincide with those of any of the genera now recognized.

New epidemiological aspect of spotted fever in the Gulf coast of Texas, L. ANGSTERN and M. N. BADER (*Science*, 96 (1942), No. 2494, pp. 357-358).—Report is made of several cases of spotted fever in an area of the Gulf coast of Texas, apparently transmitted by the lone star tick.

On penicillin, K. MEYER, E. CHAFFEE, G. L. HOBBY, M. H. DAWSON, E. SCHWENK, and G. FLEISHER (*Science*, 96 (1942), No. 2479, pp. 20-21).—Description is given of a method for the extraction from *Penicillium notatum* of penicillin, a powerful antibacterial substance discovered by Fleming⁷ in 1929. Compared to other naturally occurring bactericidal substances like pyocyanine, gliotoxin, gramicidin, or actinomycin, the isolation of penicillin proved rather difficult. This is due to the great instability of the agent and to the simultaneous production by the mold of many yellow pigments of similar chemical properties which are practically inactive as bactericidal agents. Reference is made to the remarkable chemotherapeutic effect of purified penicillin, coupled with a low toxicity, as reported by Chain and his associates in 1940.⁸

Activity of penicillin in vitro, G. L. HOBBY, K. MEYER, and E. CHAFFEE (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 277-280).—The findings here reported confirm the observations of H. W. Florey et al.⁹ on the antibacterial activity of penicillin against gram-positive organisms. Preparations have been obtained of such activity that 0.03γ inhibits the growth of 2 to 4 million hemolytic streptococci. This represents an equivalent of 240-250 Oxford units per milligram.

Observations on the mechanism of action of penicillin, G. L. HOBBY, K. MEYER, and E. CHAFFEE (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 281-285, figs. 3).—In continuation of earlier work (see above), it was shown that penicillin acts either as a bacteriostatic or bactericidal agent depending on the experimental conditions. The number of organisms decreases at a constant rate until 99 percent of the organisms have been destroyed. The rate of killing varies with different organisms. The action of penicillin on hemolytic streptococci is not accompanied by lysis of the organisms. No detectable amount of penicillin is destroyed or absorbed from solution by the organisms. It appears to be effective only when active multiplication takes place.

Chemotherapeutic activity of penicillin, G. L. HOBBY, K. MEYER, and E. CHAFFEE (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 285-288).—Penicillin has been shown to be highly effective against hemolytic streptococcus and pneumococcus infections in mice when given subcutaneously, intravenously, or intraperitoneally. When given in the form of oil suspensions or dry pellets, a single subcutaneous injection confers a high degree of protection. Penicillin is apparently nontoxic within the range of therapeutic dosage.

⁷ Brit. Jour. Expt. Pathol. 10 (1929), No. 3, pp. 226-236, figs. 4.

⁸ Lancet [London], 1940, II, No. 8, pp. 226-228.

⁹ Lancet [London], 1941, II, No. 7, pp. 177-188, 189, figs. 8.

Chronic toxicity of diphenylene sulfide to the albino rat, J. O. THOMAS, F. DEEDS, and A. J. COX. (U. S. D. A. et al.). (*Food Res.*, 7 (1942), No. 2, pp. 161-169, fig. 1).—The continued feeding of diphenylene sulfide to young male albino rats for 165 days resulted in lessened growth rates on concentrations of 0.10 and 0.05 percent, but not on 0.025 percent, in the diet. Food consumption decreased as the slopes of the growth curves decreased and varied inversely with the concentration of diphenylene sulfide in the diet. Retardation of growth on the 0.05-percent dosage level was due to the decrease in food intake. Even on the diet containing 0.10 percent diphenylene sulfide inanition was chiefly responsible for the inhibition of growth. The spleens of the experimental animals decreased in weight as the dose of the sulfide increased. The histology of the organ, however, remained normal. A light brown pigmentation of the epithelial cells of the proximal convoluted tubules of the kidneys was seen. There was no evidence of cell destruction or of blood injury.

Control of sheep diseases, R. R. DYKSTRA, L. M. RODERICK, J. W. LUMB, H. FARLEY, and J. H. WHITLOCK (*Kansas Sta. Cir.* 212 (1942), pp. 19).—A practical account of the diseases of sheep and their control.

The occurrence of uncomplicated cobalt deficiency of sheep in South Australia, I. W. McDONALD (*Austral. Vet. Jour.*, 18 (1942), No. 3, pp. 107-115, figs. 5).—Evidence is presented of the occurrence of a simple dietary deficiency of cobalt in sheep in South Australia. There was no evidence that a deficiency in copper was involved.

The efficacy of cobaltized salt for the prevention of cobalt deficiency symptoms in sheep, J. E. BOWSTEAD, J. P. SACKVILLE, and R. D. SINCLAIR (*Sci. Agr.*, 22 (1942), No. 8, pp. 479-481, fig. 1).—The feeding of cobaltized salt was as satisfactory as the feeding of cobalt chloride in solution to thrifty sheep on a low cobalt ration, as evidenced by the similarity in average growth, reproduction, and fleece weights of the two groups. Under the conditions of the trial the use of a cobaltized salt mixture containing 4 oz. of cobalt chloride per ton of salt provided 64 percent as much cobalt as when 8 mg. of cobalt in solution was fed weekly. This lower cobalt intake was sufficient to maintain the ewes in as satisfactory a condition as when larger amounts were administered in solution.

Enzootic ataxia and copper deficiency of sheep in Western Australia, H. W. BENNETTS and A. B. BECK (*Austral. Council Sci. and Indus. Res. Bul.* 147 (1942), pp. 52).—This summary of enzootic ataxia, a disease of the unweaned lamb characterized clinically by a failure of coordination of muscles of the hind limbs and pathologically by demyelination of the nervous system, a typical degeneration of the spinal cord being pathognomonic, is followed by a discussion of the effect of copper deficiency in adult sheep. A low copper status of the mothers (liver, blood, and milk) and of the affected progeny (liver and blood) has been constantly demonstrated in all cases investigated. The disease is prevented by administration of copper supplements to the mother, and in the lamb the course of the disease is arrested by copper treatment. Copper promotes optimal growth in lambs and has a marked beneficial effect on the adult members of the flock, anemia and other signs of ill health being absent in the breeding ewe and wool growth being normal throughout. A list is given of 53 references.

Urinary calculi in sheep: A short review of relevant literature, W. I. B. BEVERIDGE (*Austral. Vet. Jour.*, 18 (1942), No. 3, pp. 127-132).—This review is presented with 19 references to the literature.

The parasitic worms of sheep in Scotland and their control, D. ROBERTSON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 54 (1942), pp. 54-79, figs. 8).

Survival of sheep nematodes in pastures, D. A. SHORR. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 7, pp. 329-337).—The importance of pasture rota-

tion for the control of gastrointestinal parasites of sheep led to the experimental work with their more important nematode parasites conducted at the Beltsville Research Center in 1938-39 here reported. In the first experiments on summer pastures it was shown that the time necessary for the pastures to become free from preparasitic stages of the nematodes originally present was less than 3.5 mo. The second experiment reduced this period to less than 2.5 mo. The third experiment showed that the time may be only 2 mo., and that even the presence of an abundance of shade and a heavy growth of grass may not protect the early stages of the nematodes. In the winter or late fall there was no development to infectivity of preparasitic stages of ovine nematodes, but a small number of *Ostertagia* and *Trichostrongylus* in the egg or preinfective larval stage survived and developed to the infective stage the following spring. There was evidence that preinfective stages of *Nematodirus* and *Ostertagia* survived the cold weather of early spring but did not become infective until late in the spring. Eggs of *Trichuris ovis* survived on the pasture for as long as 3.5 mo. in summer.

Listerellosis in a goat, R. GIFFORD and D. F. EVELETH. (Ark. Expt. Sta.). *Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 788, pp. 413-417, figs. 3).—Description is given of a case of listeriosis, or "circling disease," in a goat from northwestern Arkansas. *Listeria monocytogenes* was isolated from the brain of this animal. Its morphology, motility, cultural characteristics, biochemical behavior, pathogenicity, and agglutination reactions are outlined in detail.

Diseases of swine, C. G. GREY and C. N. DALE (*U. S. Dept. Agr., Farmers' Bul.* 1914 (1942), pp. 32, figs. 7).—This practical account supersedes *Farmers' Bulletin* 1244 (*E. S. R.*, 49, p. 787).

A study of hemolytic streptococci from a horse treated with sulfanilamide after streptococcal bacteriemia developed during immunization, J. L. HENDRY (*Jour. Infect. Diseases*, 70 (1942), No. 2, pp. 112-118, figs. 4).—"Hemolytic streptococci isolated from the blood taken the day before death from a horse under treatment for 10 days with sulfanilamide for streptococcal bacteriemia were found to be considerably more resistant in vitro to the action of sulfanilamide than the standard culture with which the horse was being immunized. Those recovered from one of the heart valves at autopsy appeared to be definitely less resistant than those from the blood but more resistant than the standard strain. The hemolytic streptococci from the spleen were found to be markedly susceptible to the action of the drug. Evidence was obtained that the resistance of the micro-organisms in the blood to sulfanilamide increased progressively during therapy. There was apparently no decrease after 14 mouse passages in the resistance to the drug of the one culture tested. Sulfanilamide-inhibiting activity was demonstrated in broth filtrates of the standard strain as well as of the streptococci from the blood, heart, and spleen. The inhibiting activity was produced sooner by the drug-resistant micro-organisms. The presence of a primary aromatic amine in the filtrates was not detectable."

Rabies, L. T. WEBSTER (*New York: Macmillan Co.*, 1942, pp. VI+168, figs. 8).—In part 1 of this work the diagnosis of rabies is presented in six chapters and in part 2 the prevention of rabies in four chapters. A 13-page list of references is included, and additional data, including tables on the immunizing potency of antirabies vaccine, are given in appendixes.

Estudios inmunológicos sobre la pluralidad de los virus rábicos en Venezuela (Immunological studies on the plurality of rabies viruses in Venezuela), V. KUBES and F. GALLIA (*Bol. Inst. Invest. Vet. [Venezuela]*, 1 (1942), No. 1, pp. 45; *Eng. abs.*, pp. 43-45).

Experimental nicotinic acid deficiency in the adult silver fox, A. Z. HODSON and J. K. LOOSLI. (*U. S. D. A., Cornell Univ., et al.*). (*Vet. Med.*, 37 (1942),

No. 11, pp. 470-473, figs. 3).—"Nicotinic acid deficiency was produced experimentally in 10 adult silver foxes. The symptoms of the deficiency are inflamed and pus-filled areas in the cheek and around the teeth—more rarely on the tongue, refusal of food, gastrointestinal hemorrhage, and finally a collapse condition in which the animal has become completely relaxed and at least partially unconscious. Five animals which received oral administration of nicotinic acid before the collapse stage of the deficiency was reached recovered completely. Five animals which reached the collapse stage, even though nicotinic acid was given to 3 of them, died. Other than the collapse of the animal, there is no clear line of demarcation between the mild and severe deficiency, as the degree of mouth inflammation varies from animal to animal and often recedes slightly in the collapse stage."

Spontaneous coccidioid al granuloma in the lungs of wild rodents, L. L. ASHBURN and C. W. EMMONS (*Arch. Pathol.*, 34 (1942), No. 5, pp. 791-800, figs. 3).—A further report of findings in rodents trapped in the desert around San Carlos, Ariz. (*J. S. R.*, 86, p. 828).

A serological study of some avian relationships, R. J. DEFALCO. (Rutgers Univ.). (*Biol. Bul.*, 83 (1942), No. 2, pp. 205-218, fig. 1).

The immunization of fowls against mosquito-borne Plasmodium gallinaceum by injections of serum and of inactivated homologous sporozoites, P. F. RUSSELL and B. N. MOHAN (*Jour. Expt. Med.*, 76 (1942), No. 5, pp. 477-495, fig. 1).—Report is made of attempts to immunize domestic fowls against mosquito-borne infections of *P. gallinaceum* by means of (1) vaccination with inactivated homologous sporozoites, (2) injections of serums, both normal sheep serum and serum from fowls chronically infected with homologous *Plasmodium*, and (3) combinations of both sporozoite vaccine and serum. "It was possible to reduce the normal malaria death rate (55.4 percent) in these fowls by each of the above methods but most markedly by the combined prophylactic treatment. Mortality rates were 21.1 percent in vaccinated fowls, 16.7 percent in serum-treated fowls, and 7.3 in those having the combined treatment. Intensity of infection was measured by counting the percentage of red cells infected each day. It was found that in each group of fowls having prophylactic treatment the average of highest percentages of red cells infected was less than in untreated malarious fowls (30.1 percent). The average figure was 20.5 percent in vaccinated fowls, 17.9 percent in those having serum injections, and 15.0 percent in those having combined treatment. The prepatent period was not markedly affected by any of the prophylactic procedures. It averaged 9.1 days in the untreated group, 8.9 days in both the vaccinated and serum-treated groups, and 9.7 days in the group having combined treatment."

Reciprocal transmission tests with infectious catarrh of chickens, mice, and rats, J. B. NELSON (*Jour. Expt. Med.*, 76 (1942), No. 3, pp. 253-262).—In observations conducted over a period of 5 yr. infectious catarrh of chickens (fowl coryza of slow onset) was not transmissible to mice or rats by nasal instillation of the specific coccobacilliform bodies. Exudates were also inactive in both rodents on foot pad injection. The infectious catarrhs of the mouse and the rat were reciprocally transmissible by the nasal injection of exudates or tissue cultures of the respective coccobacilliform bodies and by direct contact. Exudates and cultures also produced an arthritic reaction in both hosts on foot pad injection. The coccobacilliform bodies of mouse catarrh were innocuous in chickens on nasal instillation, whereas those of rat catarrh were established locally but were maintained for only two passages. In the opposite host each of the two rodent forms of infectious catarrh reproduced the typical features of the naturally acquired disease, a highly fatal pneumonia being characteristic of the mouse but not of the rat.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Ohio Station] (*Ohio Sta. Bul.* 617 (1940), pp. 67-68).—These included work on corn storage, showing, among other results, that corn dried to less than 14 percent moisture content should be placed in tight bins to prevent reabsorption of moisture, although ample ventilation is necessary to prevent molding of green corn (coop. U. S. D. A.); and barn curing experiments, showing that alfalfa hay will undergo about three-fourths of the necessary moisture reduction in about 4 hr. of good field drying, after which the remainder of the necessary drying can be done by means of air driven by a pressure fan through suitable air flues in the barn, with improvement in the nutritional quality of the hay.

Surface water supply of the United States, 1940, parts 1, 2, 3, 5, 8; 1941, parts 7, 9, 10, 12-14 (*U. S. Geol. Survey, Water-Supply Papers* 891 (1942), pp. IX+567, pl. 1; 892 (1942), pp. VIII+441, pl. 1; 893 (1942), pp. IX+662, pl. 1; 895 (1942), pp. VII+340, pl. 1; 898 (1942), pp. VIII+426, pl. 1; 927 (1942), pp. VI+355, pl. 1; 929 (1942), pp. VI+311, pl. 1; 930 (1942), pp. IV+123, pl. 1; 932 (1942), pp. V+214, pl. 1; 933 (1942), pp. VI+246, pl. 1; 934 (1942), pp. V+229, pl. 1).—These papers record measurements of stream flow, No. 891 covering the North Atlantic slope basins, No. 892 the South Atlantic slope and eastern Gulf of Mexico basins, No. 893 the Ohio River Basin, No. 895 the Hudson Bay and upper Mississippi River basins, and No. 898 the western Gulf of Mexico basins for the year ended September 30, 1940; and No. 927 the lower Mississippi River Basin, No. 929 the Colorado River Basin, No. 930 the Great Basin, No. 932 the Pacific slope basins in Washington and upper Columbia River Basin, No. 933 the Snake River Basin, and No. 934 the Pacific slope basins in Oregon and lower Columbia River Basin for the year ended September 30, 1941.

Surface water supply of Hawaii, July 1, 1939, to June 30, 1940 (*U. S. Geol. Survey, Water-Supply Paper* 905 (1942), pp. IV+136).—This report presents measurements of stream and ditch flow in the Territory.

The effect of wall-friction on gravity-waves, M. P. O'BRIEN and A. D. CHAFFIN, JR. (Univ. Calif.). (*Amer. Geophys. Union Trans.*, [23] (1942), pt. 1, pp. 84-87).—The authors show the development of a formula to predict the width of channel necessary to obtain inappreciable energy losses through wall friction for a particular combination of depth and period and length of wave, together with experiments showing that the theory is sufficiently accurate for the purpose.

The expression arrived at is given in the form $P_1 - P_2 = \int_0^l (N/T) dx$, in which P_1 is the power transported into the reach at $x=0$ and P_2 is the power leaving at $x=l$, N is the dissipation of energy per cycle per unit-length of channel, and N/T is the average rate of dissipation. Since the power loss is intended to be small, the equation may be rewritten as $\Delta P/P_1 = (N_1/TP_1) l$, in which $(\Delta P/P_1)$ is the fractional permissible power loss and N_1 is the loss per cycle per unit-length of channel at the first station.

Canal lining cured by sprayed coats of white-pigmented compound, O. G. BODEN (*Jour. Amer. Concrete Inst.*, 13 (1942), No. 5, pp. 449-451, fig. 1).—The heat-reflecting characteristics of a white-pigmented compound kept concrete temperatures as low as when the clear-coated concrete was burlap shaded.

Fuel consumed and work performed by farm tractors, A. P. BRODELL and M. R. COOPER (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1942, *F. M.* 32, pp. [2]+29).—This report summarizes the findings on fuel consumption, acreage plowed, width of plows used, and total time of tractor use in 1940 in the study previously noted (*E. S. R.*, 88, p. 108).

Simple control system for cooling potato storages, T. E. LONG (*North*

Dakota Sta. Bimo. Bul., 5 (1942), No. 1, pp. 8-12, figs. 5).—The author describes a set-up including a differential thermostat of which the elements are placed one in the ceiling inside the storage space, the other outside the building with setting of the thermostat such that the fan is operated whenever the outside temperature is lower by 2° or 3° than that inside the building. A frost-prevention thermostat with sensitive elements in the air intake stops the fan motor when the incoming air reaches a temperature low enough to cause freezing. The wiring arrangements are shown.

Farm buildings, D. G. CARTER and W. A. FOSTER (*New York: John Wiley & Sons; London: Chapman & Hall*, 1941, 3. ed., rewritten, pp. IX+404, figs. 222). The third edition of this book has been, like the second (E. S. R., 59, p. 883), very fully revised and rewritten. A series of problems for further study has been added. The contents of the new edition are: Economics and costs of farm buildings; building materials—lumber and logs; concrete—other masonry; miscellaneous building materials; structural requirements; the structure of farm buildings; cost and quantity calculation; arrangement and location of farm buildings; environmental conditions in farm buildings; farm barns—general purpose barns; dairy barns; special purpose barns; poultry housing; swine housing; silos; grain and hay storage; storage and service buildings; farm housing conditions and needs; farmhouse planning; kitchens and storage equipment; house construction—general problems; specifications—details of house construction; and house remodeling.

AGRICULTURAL ECONOMICS

[Papers and notes on agricultural economics] (*Jour. Farm Econ.*, 24 (1942), Nos. 2, pp. 369-529, figs. 2; 3, pp. 557-703, figs. 8).—No. 2 includes papers on: Legislative and Administrative Reasoning in Economics, by J. R. Commons (pp. 369-391) (Univ. Wis.); Forty Years of Farm Management Research, by J. A. Hodges (pp. 392-401) (Kans. Expt. Sta.); Proposal for Revision of *Agricultural Statistics*, by N. Jasny (pp. 402-419); The Scale of Operations in Agriculture, by R. W. Ridd and D. L. MacFarlane (pp. 420-433) (Univ. Ky.); The Disposal of Agricultural Surpluses, by J. B. Condliffe (pp. 434-446) (Univ. Calif.); Obstacles to Agricultural Production Expansion by R. Schickele (pp. 447-462) (Iowa Sta.); and Schisms in Agricultural Policy—The Shift in Agricultural Policy Toward Human Welfare, by M. Ezekiel (pp. 463-476) (U. S. D. A.), Agriculture as a Commercial Industry Comparable to Other Branches of the Economy, by M. R. Benedict (pp. 476-496) (Univ. Calif.); and Rescue Programs and Managed Agricultural Progress, by J. B. Canning (pp. 496-511), with a discussion by T. W. Schultz (Iowa State Col.) and A. B. Wolfe (Ohio State Univ.). Notes are included on An Economic Analysis of Length of Feeding Period in the Production of Hogs, by R. E. Menze (pp. 518-523) (Iowa State Col.); Relation of Income to Farm Capital, by A. B. Lewis (pp. 523-528) (U. S. D. A.); and An Investigation on Complementarity Relations Between Fresh Fruits—A Rejoinder, by S. Hoos (pp. 528-529).

No. 3 includes papers on: Agricultural Price Policies in War Time, by H. Working (pp. 557-570); New Frontiers of the Great Plains, by C. F. Kraenzel (pp. 571-588) (Mont. Expt. Sta.); Stabilization Operations of the Commodity Credit Corporation, by G. Shepherd (p. 589-610) (Iowa Sta.); Conservation Expenditures on Federal Lands, by A. Z. Nelson (pp. 611-620) (U. S. D. A.); An Ancient Experience With Price Control, by H. Kirchberger (pp. 621-636); A Method of Determining Feasible Irrigation Payments, by H. E. Selby (pp. 637-646) (U. S. D. A.); and Rationing Objectives and Allotments, Illustrated With Sugar Data, by J. J. Kaplan (pp. 647-664) (Iowa Sta.). Notes are included on:

Economic Aspects of Artificial Insemination of Commercial Dairy Cows, by A. A. Dowell and L. M. Winters (pp. 665-676) (Minn. Sta.); **The Iowa Statutory Provisions for Automatic Lease Renewal**, by V. B. Sullam (pp. 677-684); **Peasant Farming in India**, by I. W. Moomaw (pp. 685-694); **Determination of Relative Risks Involved in Growing Truck Crops**, by W. K'ing (pp. 694-698) (U. S. D. A.); and **What We Eat**, by L. and P. Williamson (pp. 708-703) (Cornell Univ.).

[**Investigations in agricultural economics by the North Dakota Station**] (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 1, pp. 15-20, 32-33).—Included are articles, **Land Values and Transfers in North Dakota**, by M. H. Taylor (pp. 15-18), making analysis of the land transfers in Traill and Ward Counties during the second quarter of 1942 and briefly discussing the factors affecting land values in North Dakota (coop. U. S. D. A.); and **Efficient Transportation Now a Necessity**, by P. V. Hemphill (pp. 18-20), briefly discussing the present transportation conditions in the State and outlining means by which transportation facilities can be conserved. The usual tables of North Dakota farm prices are brought down through August 1942 by Hemphill.

[**Investigations in agricultural economics by the Ohio Station, 1939**]. (Partly coop. U. S. D. A.). (*Ohio Sta. Bul.* 617 (1940), pp. 62-66).—Brief general findings are reported on studies of methods of renting farm lands in the State, the legal aspects of landlord-tenant relationships, the relation of retail prices to quality of fresh and canned fruits and vegetables, and the principal types of egg and poultry handling by cooperative associations. Also included are tables showing the percentage by months of the annual farm income received from different products and the average rates charged for the transportation of hogs to Cleveland by mile zones, 1937-39, by motortrucks and by railroads.

[**Investigations in agricultural economics by the Ohio Station**] (*Ohio Sta. Bimo. Bul.* 218 (1942), pp. 160-162).—An article by C. W. Hauck and J. K. Samuels based on data for 87 independent retail grocery stores in Cincinnati includes and discusses tables showing the relation of percentage of margin to sales of fruits and vegetables and between attractiveness of display and sales. The table of index numbers of production, prices, and income by J. I. Falconer is brought down through July 1942.

[**Investigations in agricultural economics by the Rhode Island Station**] (*Rhode Island Sta. Rpt.* [1941], pp. 3-10).—General findings are reported for studies of (1) the Rhode Island receipts of canned milk in 1940 as compared with 1933-38 and 1921-25; (2) the receipt of fluid milk and consumption in Newport in 1940 as compared with the period 1935-39; (3) the trucking of milk to Providence, which includes receipts, sources of supplies, average number of producers per truck, quantity per producer, hauling charges, possible savings in mileage and costs under a proposed reorganization of the trucking system, etc. (coop. U. S. D. A. et al.); (4) the trends of agriculture in Providence and Bristol Counties; and (5) the production and marketing of potatoes in the State.

An economic analysis of farming in the Cedar Creek Soil Conservation Demonstration Area, Franklin County, North Carolina, 1935, R. E. L. GREENE. (Coop. U. S. D. A.). (*North Carolina Sta. Tech. Bul.* 70 (1942), pp. 32, figs. 7).—This report is based on data for the crop year 1935 for 172 farms in the west central part of Franklin County. The area is included in the eastern two-thirds of the Cedar Creek Soil Conservation Demonstration Area established in 1935. The physical, economic, and social characteristics of the county are described, and analysis is made of various factors.

The average size of farm in 1935 was 134 acres, with 43 acres in crops, 14 in idle cropland, 5 in open pastures, and 73 in woods and waste. No definite cropping rotation was followed. In 1935 about 70 percent of the land in corn and tobacco and 90 percent of that in cotton had been in row crops in 1934.

Livestock production in the area was small. The average labor income in 1935 was \$554 per farm. Of the farms, 14 percent had a minus labor income, 37 a labor income of less than \$250, and only 19 percent an income of over \$1,000. The average labor income increased from \$209 for farms using less than 200 man-work units to \$1,181 for those using 600 or more work units. As the acreage in crops increased from less than 25 to 100 or over, the labor income increased from \$364 to \$1,286. The farms with a crop index of less than 85 had an average labor income of \$176 as compared with \$895 for those with a crop index of 100 to 114. With less than 150 work units per man, the labor income was \$305 as compared with \$1,013 with 300 or more units per man. Sixty-six percent of the operators, including croppers, were tenants. Tenants had only about one-half as many acres in crops as owners and part owners. They had lower labor efficiency, lower crop yields, and a slightly higher percentage of the crop area in row crops and a smaller percentage in soil-improving crops.

Economics of soil conservation in West Virginia, E. C. WEITZEL. (Coop. U. S. D. A.). (*West Virginia Sta. Bul.* 305 (1942), pp. 59, fig. 1).—"This study concerns the economic feasibility of a definitely planned program of soil conservation on privately owned farm lands which has been demonstrated by the Soil Conservation Service. Data for five successive years (1935-39) covering approximately 900 farms in six areas of West Virginia have been studied to determine (1) changes in land use, cropping practices, and livestock programs as a result of the conservation plans; (2) some problems of management associated with conservation on farms of various types; and (3) the economic feasibility of the adoption of indicated soil conservation plans by self-sufficing and by commercial farmers." The demonstration program, the movement for soil conservation districts, and the general factors affecting conservation are discussed. In the analysis of the changes in agriculture during the 5 yr. of the conservation effort, the farms are divided into cooperating and noncooperating and beef cattle, dairy, general, and small subsistence farms. An analysis is made for the years 1935, 1937, and 1939 of the types of farming, land use, crop production, fertility practices, crop yields, livestock production, and farm receipts and income. In appraising the feasibility of conservation, three farms in each of the four types of farms were selected for case analysis. Planning for conservation is discussed.

In general, the program of the Conservation Service did not greatly alter the agriculture of the various areas, although some noteworthy changes took place. Both cooperating and noncooperating farms reduced their cropland, particularly the corn and wheat acreages. The reduction was greater for the cooperating farms. Cooperating dairy, beef cattle, and general farms increased their acreages of alfalfa. Cooperating farms appeared to be increasing the quality of cropping systems somewhat more than noncooperating farms. The acreages of both crop and pasture lands treated with lime and fertilizer were greatly increased. Small self-sufficing farms did not cooperate in any of the public programs to any appreciable extent. The numbers of livestock on both cooperating and noncooperating farms were increased, the increase being greater on the cooperating farms. "The greatest problem of soil conservation in West Virginia is the small size of farm units and poor management. Low incomes as a result of small farms, and lack of intensity in business organization, discourage and prohibit conservation. Consumption requirements are greater than net income; hence resources are exploited."

The author suggests that the following major conclusions might be derived from the study: "(1) The various agencies seeking to aid conservation should adapt their programs to fulfill the most urgent needs of the several types of

farming; let them differentiate between self-sufficing and commercial units in particular. The causes for depletion and exploitation must be removed before subsidies for fertility practices and similar programs will give permanent improvement. (2) Many farm units are too small and of such low quality that exploitation is inevitable as a result of subsistence pressure. Such units need to be enlarged or relocated; and the production program of many units, both large and small, must be more intensively organized so as to produce a volume of income sufficient to satisfy family, capital, and conservation needs. (3) Less attempt to make conservation a type of public works and direct subsidies, and more effort toward teaching farmers the nature of their resources and how to manage them without burdensome cash outlays, would probably result in greater understanding and appreciation of the land and in more permanent soil conservation. (4) It would be unreasonable to compel the application of land-use measures under the police power authorized by the soil conservation district law unless the measures are economically feasible in terms of the farm business to which they are applied."

More food through conservation farming, A. T. SEMPLE ET AL. (*U. S. Dept. Agr., Farmers' Bul. 1909 (1942), pp. [2]+54, figs. 47*).—"This bulletin discusses in general the ways in which conservation measures increase crop production, improve pasture and range, and maintain the productivity of the soil."

Farm income and expenses of Farm Security Administration borrowers: Summary report, all regions, 1940, C. A. STOKSTAD (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, F. M. 33, pp. [1]+10, fig. 1*).—Tables show by Farm Security Administration regions and by States in each region the averages per farm per crop, livestock and livestock product sales, other farm income, other income not from the farm, total farm and family operating expenses, cash value of living from farm, capital expenditures, and debt payments for 16,191 Farm Security Administration borrowers.

Mountain farming in the Ozark area of western Arkansas, with particular reference to goat dairying as a use for low-grade land, G. TOWNSEND (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, F. M. 31, pp. [2]+31, figs. 2*).—This study was made "to ascertain the sources and the level of income obtained by a representative group of 'mountain farmers'; and to develop and analyze data describing the production requirements and returns for each of the more important farm enterprises common to the locality." The data were obtained by interviewing 30 farmers in the northwestern part of Newton County. "The first section describes various aspects of farm organization, operation, and earnings in 1940. The second section presents the usual, or typical, handling practices, production requirements, and production rates for milk goats and the three other livestock enterprises [dairying, hogs, and sheep] from which the income of most of the farms is derived. The third section compares the four livestock enterprises in terms of their suitability as major farm enterprises. The final section is devoted to an over-all consideration of opportunities for expanding goat dairying and some facts bearing upon the feasibility of cheese manufacturing as a possible means of improving market outlets for goat's milk."

Farm-adjustment opportunities in Washington Parish, Louisiana, K. L. BACHMAN and R. J. SAVILLE. (*Coop. La. Expt. Sta.*). (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, F. M. 34, pp. [2]+73, figs. 7*).—The present agricultural situation in the parish—the historical development, climatic conditions, soil resources, the farming, types of farm organization, and income from different types of farm organizations; and the farm adjustment opportunities—long-time adjustments in size of farms, alternatives for present farm organizations, the possibility of added income from farm forestry, and of tung production—are discussed. A pattern for better farm living is outlined.

Farmer experience with the beef cattle enterprise in Louisiana, F. MERRICK and J. N. EFFERSON (*Louisiana Sta. Bul. 353 (1942), pp. 31, fig. 1*).—Detailed records for the year ended August 1940 were obtained by interviews for 197 farms having at least 20 head of breeding stock. The farms were located in the eastern general farming, the central mixed farming, the Mississippi Delta cotton farming, the rice farming, and the southwestern cut-over areas. Analysis is made of the operating costs, the overhead costs, gross returns, net operating returns, and the relations of size of herd, calving percentage, hours of man labor per head, mortality rate, capital turn-over, and quality of cattle to costs and returns.

The net operating returns per farm and per head of cattle were: Eastern area \$828 and \$5.17, central area \$677 and \$4.36, Delta area \$603 and \$4.05, rice area \$676 and \$4.41, cut-over area \$208 and \$2.50, and all farms \$576 and \$4.18. Overhead costs per head were \$5.19, \$6.26, \$6.26, \$5.00, and \$1.79 in the respective areas. For all farms the net operating returns less overhead costs resulted in a net loss of \$146 per farm or \$1.06 per head of grown stock. Net operating returns per head on farms above and below the average for different factors were: Small herds (average 79 head) \$3.49 and large herds (average 238 head) \$4.57; low calving percentage (average 47) \$2.72 and high percentage (average 74) \$5.76; low amounts of man labor per cow (average 4.1 hr.) \$4.54 and high amount (average 12.3 hr.) \$3.70; low mortality rate (average 2 percent) \$5.35 and high rate (14 percent) \$2.51; low capital turn-over (average 12 percent) \$3.65 and high turn-over (33 percent) \$4.79; and low value per head (\$26) \$2.91 and high value (\$39) \$5.22. "The most favorable net returns per farm and per head were found for farms with larger-than-average-sized herds; calving percentage of more than 60 percent; more efficient use of labor, horses, and pasture; low mortality rates; a relatively high capital turn-over; and high-quality cows."

Area analysis and agricultural adjustments in Nemaha County, Kansas, W. H. PINE. (Coop. U. S. D. A.). (*Kansas Sta. Bul. 305 (1942), pp. 47, figs. 6*).—"The primary purpose of this study was to determine desirable agricultural adjustments for Nemaha County, Kansas. Secondly, methods of analyzing an area and determining adjustments were tested. This publication emphasizes the adjustments, but a brief description of the method adopted is presented for the benefit of those who may be interested in applying the general method to other counties.

"In this study it was attempted to relate a number of variables which affect the success of individual farms and an area as a whole. A number of factors were also studied which indicate the success of the agricultural economy in the area. Included among these factors were items such as condition of farmsteads and tax delinquency. An exhaustive analysis of the influence of any one factor was not attempted.

"The analysis began with an inventory of (1) the physical resources, (2) present land utilization, and (3) the indicators of the degree of success of the agriculture of the county. Based upon the data in the inventory, the county was divided into 25 agricultural areas. While all factors were considered, five were used principally in the delineation process: (1) Land type (soil), (2) physical land use (crop or pasture), (3) size of farm, (4) condition of farm finance, and (5) condition of the farmstead.

"Suggested adjustments for an area were determined by (1) comparing the area with the other areas in the county with respect to resources, the uses of the resources, and the relative success of the agriculture; and (2) preparing budgets for various systems of farming and sizes of farms."

Trends in agriculture, Providence and Bristol Counties, Rhode Island,

1850-1940, J. L. TENNANT (*Rhode Island Sta. Misc. Pub. 10* [1942], pp. [2]+35, figs. 17).—Tables and graphs are included with brief discussions showing for the State, Providence County, and Bristol County by the U. S. Census of Agriculture periods the changes in population (1800-1940) and in acreage, numbers, or production of hay, corn, potatoes, dairy cows, milk, butter, chickens, eggs, hogs, sheep, beef cattle, pear, peach, and apple trees, grapevines, and vegetable crops. The beginning dates for the tables, other than that for population, vary from 1850 to 1900.

A study of land use in thirty-one towns in Aroostook County, Maine, A. E. WATSON (*Maine Sta. Bul. 413* (1942), pp. [3]+53-106, figs. 11).—The purpose of this study is to provide some fundamental data which may be used as a basis for developing an adequate and feasible land-use program within the area studied. The agricultural development and agricultural trends of the area, the soils and topography, roads, and present land use, etc., are described. The land in the area was classified into five classes "according to its present intensity of use, and the probable future use or uses, after consideration of its physical characteristics and various economic factors." A map shows the location of the various land classes. The farms were classified as good, fair, poor, or abandoned, largely on the basis of size and conditions of the buildings; size, shape, and topography of the fields; and the general state of cultivation of crops being grown. The situation in a problem area is described, and policies appearing to have potentialities of practical application in the area are discussed.

Land class V (the best agricultural land) included 12.8 percent of the land; class IV (areas under good cultivation, but the agriculture not so intensive as in class V) 26; class III (agriculture in state of decline or nearly defunct) 3.4; class II (practically abandoned for agriculture) 0.2; class I (permanent forests) 53.9; and nonagricultural uses 3.7 percent. "The better land classes had a larger percentage of road mileage improved, more farms located on Caribou loam, a wider distribution of electricity and telephone services, and larger farm units than was found in the poorer areas. The average general property tax per farm was highest in land class V. The highest tax delinquency occurred in the better agricultural areas. Overassessment, size of the farm, and a heavy debt load undoubtedly have contributed to this situation." The program suggested for handling the marginal and submarginal areas is development of resources within the area, relocation of isolated families, and the development of town forest areas.

Egg production in Maine, G. F. DOW (*Maine Sta. Bul. 412* (1942), pp. [3]+51, figs. 10).—This is the first report of a series planned on the economics of the production and marketing of poultry and eggs in Maine. The information contained includes "the general set-up of poultry production in the State, care and handling of eggs, breeds of layers, size of flocks, seasonal variation in egg production, date of hatching pullets, mortality and disease problems, and the utilization of eggs." The marketing of hatching eggs and baby chicks, the sale of market eggs, and the marketing of live and dressed poultry are to be included in the later reports. Most of the detailed information was obtained through interviews obtained from 86 poultrymen in different sections of the State for the year ended June 30, 1941. The size of flocks studied varied from about 200 to 4,833 layers. Of the 86 farms studied, 51 received at least 90 percent of their total farm income from their poultry flocks.

Thirty years of farming in Tompkins County, New York, E. G. MISNER ([*New York*] *Cornell Sta. Bul. 782* (1942), pp. 59, figs. 3).—This bulletin brings together and compares some of the results obtained in a farm-management study for the crop year 1907 (E. S. R., 25, p. 594), a study of 250 farms in Dryden Township for the crop year 1917, a study (in cooperation with the U. S. Depart-

ment of Agriculture) of labor-income records of 916 farms in six townships for the year 1927 (E. S. R., 71, p. 867), and a study of the crop year 1937 of 544 farms in five townships (E. S. R., 83, p. 690). The comparisons include weather, prices, tenure, classification of the land, operator's history, types of farming, size of farms, capital, assets and liabilities, receipts, expenses, labor income, farm privileges, and cost of living. The factors affecting labor income are analyzed and discussed. The business-analysis factors for a well-organized and successful dairy farm, a dairy and poultry farm, a dairy and cash-crop farm, a cash-crop farm, and a specialized farm are given and discussed.

The production and marketing of cabbage in New York, R. W. HOCKER ([*New York*] *Cornell Sta. Bul.* 780 (1942), pp. 51, figs. 26).—"The purpose of this bulletin is to assist growers, dealers, kraut manufacturers, wholesalers, and others in determining effective methods of cabbage production and marketing. It is based on data from various sources, and on information obtained in a special study of cabbage production and marketing."

The section on cabbage production describes and discusses the types of farming, acreages, yields, and cultural practices in the different cabbage areas of the State, the factors affecting production, prices received by New York growers, and factors affecting such prices. Marketing by New York producers—methods of disposal, returns per ton in 1940, storage, and types of buyers—and the marketing of New York cabbage by shippers—types of transportation, seasonality of sales, storage, cost of handling stored cabbage, destination of shipments, and freight rates—are discussed. Wholesale prices in New York City and retail prices are also briefly discussed. A section on cabbage for sauerkraut manufacture discusses the production, prices received by growers, the manufacture of kraut, and the f. o. b. factory and retail prices of sauerkraut.

Trends of muskmelon production and prices by areas, with particular reference to Northeastern States, W. KLING (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1942, F. M. 36, pp. [2]+35, figs. 9).—"The muskmelon-producing areas of the United States are described. The past and prospective trends and price factors in the different areas, and the competition in the northeastern area are discussed. Suggestions are made for improving the quality of the melons.

Farm tenure law in Kansas, H. A. HOCKLEY and H. HOWE (*Kansas Sta. Bul.* 303 (1942), pp. 27).—"The objectives of this study were threefold: (1) To learn of the problems of farm tenancy that are related to, or affected by, landlord-tenant law, (2) to analyze and interpret the present status of the law, and (3) to suggest possible improvements." The material is presented in sections on security of tenure, conservation and improvements, collection of rents, and settlement of disputes. An appendix lists the Kansas statutes dealing with land lord-tenant relationships.

The stock-share lease, J. H. MCCOY and W. E. GRIMES (*Kansas Sta. Cir.* 213 (1942), pp. 39).—"This revision of Circular 155 (E. S. R., 63, p. 483) includes new sections on factors affecting the contributions of the landlord and tenant, equitability of the stock-share lease, and customary arrangements of the stock-share lease and test of fairness. Some of the sections have been enlarged.

Standards and procedure for classification and valuation of land for assessment purposes in Montana, H. H. LORD, S. W. VOELKER, and L. F. GIESEKER (Coop. U. S. D. A.). (*Montana Sta. Bul.* 404 (1942), pp. 28).—"The purpose of this bulletin is to set forth standards and procedure for the systematic assessment of agricultural land by which assessments can be made to reflect the productivity value of the land. The proposed method consists of grading land according to productivity within use classes and the determining of relative values of these grades." The determination of use classification of land and the grading of land according to productivity, yield histories, soil surveys, and other

sources of productivity information are discussed. The requirements for classification and grading of land for assessment are described, with statements of land classification grades used by the station for farming, grazing, and irrigated lands. The factors affecting land assessment valuations and methods of arriving at such valuations are discussed. A program for reassessment in a county—organization for reclassification, classifying and grading land, and determination of revaluation schedule—is discussed.

New Hampshire rural towns' comparative road burdens and road services, W. R. PARKS and J. C. HOLMES. (Coop. U. S. D. A.). (*New Hampshire Sta. Bul.* 339 (1942), pp. 31+[19]).—This study "was undertaken at the request, and under the auspices, of the State Agricultural Planning Committee." It describes briefly the rural road system of the State and its impact on the rural part of the State. The inadequacy of the rural road system is analyzed and discussed in sections on (1) unequal town burdens in construction and maintenance of town (class V) roads, dealing with the comparative ability of towns to maintain town roads, State aid to class V roads, and the extent to which town road aid and Duncan aid (State aid for maintenance of class V roads) equalize class V road burden; (2) maintenance of uneconomic roads and misclassification of town roads; and (3) unequal town burdens in the completion of secondary (SAO) mileage, dealing with the construction aids to the State secondary highways and problems of completing SAO mileage in low-valuation towns. A program of action is outlined and discussed under sections on revision of Duncan aid formula, State supervision of Duncan aid expenditures, reclassification of town roads, alleviation of low-valuation towns' burdens in SAO construction, utilization of rural resources data in projecting secondary highways, and town developments of priorities in local road improvement and maintenance. "Now that through routes are nearly completed, the planning for future construction should be based on a thorough study of its relation to restoring, conserving, and improving the agricultural and timber resources of the State and also its recreational advantages."

Price administration, priorities, and conservation of supplies affecting agriculture in the United States in 1917-18, A. G. PETERSON (*U. S. Dept. Agr., Agr. Hist. Ser. No. 3* (1941), pp. [2]+16).—The 1917-18 wartime activities of the Department, the regulation of prices, priorities, and conservation measures pertaining to farm machinery and equipment, fertilizers, insecticides and fungicides, leather goods, and foods are described and discussed.

Variations in flue-cured tobacco prices, S. L. CLEMENT (*North Carolina Sta. Tech. Bul.* 69 (1942), pp. 38, figs. 11).—The main purposes of this study were "to determine the extent of daily variations in prices paid for the same quality of tobacco on the same market; and to measure, or indicate, the influence of some of the factors responsible for these variations." The tobacco auction procedure, the Federal inspection and market news service, and the company grading systems are described. Most of the analyses are based on data regarding 66,344 lots of tobacco sold on the Farmville, N. C., market during the 1938-39 season, and records of farmers' rejections and resales of 908 lots in the 1939-40 season. Analysis is made of the daily variations in prices for individual lots of a given grade in relation to U. S. grades and selected company grades, the factors associated with price variations, the day-to-day and seasonal variations, and the financial results of resales by growers. A study was also made of the grades of tobacco purchased by the "Big Three" cigarette companies.

"The average of daily spreads between high and low prices paid for 14 representative U. S. grades in 1938 amounted to \$15.33 for 100 lb., or 63.5 percent of the season average prices of these grades. Even when the effect of

extreme chance variations had been removed by the elimination of 10 percent of the poundage at each extreme of the price range, there remained an average spread of \$8.07 per 100 lb., or 33.4 percent of the season average price. . . . For the 16 company grades selected the weighted average of daily spreads was \$7.72, or 28.89 percent of the season average price, and the average of daily spreads between the tenth and ninetieth percentiles was \$3.53, or 13.21 percent of the season average price." "The analysis of 15 representative company grades bought in 1938 on one market indicated that on the average 24.4 percent of each company grade consisted of tobacco classified in one U. S. grade, 38.6 percent in two U. S. grades, and 48.4 percent in three." In the U. S. grades of average or better quality, prices tended to increase as size of lot increased up to at least 400 lb. Interviews with growers suggested strongly that personal relationship between growers and buyers influenced prices to a considerable extent. When a number of grades were considered it did not appear that any day of the week had an advantage over other days as to prices. The studies showed that the three cigarette companies were purchasing the same grades of tobacco at the same time in 1938 on the Farmville market.

Twelve years of farm accounts in Illinois, P. E. JOHNSON and H. C. M. CASE (*Illinois Sta. Bul.* 491 (1942), pp. 185-271, figs. 36).—"The reactions of progressive farm operators to a wide variety of physical and economic conditions is shown by an analysis of nearly 18,000 records kept in cooperation with the Extension Service of the University of Illinois from 1926 to 1937. These records show the land use on the accounting farms during these years, and how investments, incomes, expenditures, and earnings differed from year to year and between farming-type areas. The records were also grouped to show differences in farm organization and income resulting from differences in size of farm and in sources of income. The farms from which these records were taken were better-than-average farms. They were larger than the average farm in their locality and had better managers." The data are presented and discussed under the following headings: Prices for the period 1926-37; changes in investments, incomes, and expenditures; investments, income, and expenditures by farming-type areas; land use on accounting farms; influence of size of farm on farm organization and income; and variations in farms due to source of income.

Inspection and control of weights and measures in the United States, G. W. HERVEY and R. S. HADSELL (*U. S. Dept. Agr., Consum. Counsel Ser. Pub.* 7 (1942), pp. [2]+VII+86, figs. 6).—"The subject matter of this report deals largely with the results of a survey of systems of weights and measures administration, conducted by the Consumers' Counsel Division in the spring of 1938 in various States, cities, and counties. Due consideration is given to existing differences between a model law prepared by the National Conference on Weights and Measures (association of weights and measures enforcement officials) and the corresponding laws of each class of jurisdiction." "In addition to the information acquired through the survey, this report contains a discussion of the historical background of the subject of weights and measures, and a brief review of relevant details of an inquiry into chain-store marketing and distribution, begun in 1928 by the Federal Trade Commission. A tabular summary of Federal laws and regulations pertaining to weights and measures and a selected, annotated bibliography are also included." Appendixes include an outline of the essentials of the model law recommended by the National Conference on Weights and Measures and the National Bureau of Standards and the two survey schedules used.

The Hoch-Smith Resolution: A study of a congressional mandate on transportation. E. O. MALOTT (*U. S. Dept. Agr., Agr. Hist. Ser. No. 4 (1942), pp. VI+117*).—"This research aimed to study the effectiveness of a legislative direction on rate making to a regulatory commission. In the course of the study many attitudes and opinions bearing upon the subject were noted and these are given as quotations to avoid, if possible, an incomplete statement of views." The Hoch-Smith Resolution (43 Stat. 801) was passed by the Congress and signed by the President in January 1925 and is still on the statutes, without amendment. This report, in addition to an introductory chapter, includes chapters on the legislative history of the resolution, Interstate Commerce Commission activity under the resolution, interpretations and accomplishments of the resolution, reasons for its failure to accomplish stated objectives, and lessons for the future. The text of the resolution is included in the appendix.

A preliminary study of cotton ginning costs in North Carolina. S. L. CLEMENT (*North Carolina Sta. Tech. Bul. 71 (1942), pp. 23, figs. 6*).—The ginning industry—number of gins, volume of cotton ginned, number of gin saws, gin capacity, kinds of power, gin ownership, and present value of gins—is described. Data for 63 gins obtained for the 1940-41 season are analyzed to show the average cost per bale for different items of ginning expense, the frequency distribution of gins on the basis of average cost per bale, and the relationship of volume of ginning and number of gin stands to ginning costs.

The number of active gins in the State declined from 2,625 in 1914 to 824 in 1940, but the number of bales per active gin practically doubled. The average number of saws per gin increased from 80 in 1906 to 211 in 1940. The cost of ginning per bale in the 63 gins studied ranged from \$2.42 to \$6.54, averaging \$3.16. The average costs for different items were: Administration 42 ct., ginning labor 55, repairs and upkeep 18, power and fuel 38, bagging and ties 81, and depreciation 46 ct. Average costs per bale declined as the number of bales increased up to 1,501-2,000 bales. Some relationship was found between ginning costs and the fee charged the grower for ginning. The estimated average receipts per bale from ginning fees, assuming fees were collected for all bales ginned, were \$3.37, being 21 ct. in excess of the average costs of ginning. The costs were in excess of the estimated receipts for approximately 43 percent of the gins.

Some factors affecting the quality of ginning services in South Carolina. J. M. STEPP and H. A. WHITE. (Coop. U. S. D. A.). (*South Carolina Sta. Bul. 344 (1942), pp. 15, fig. 1*).—"This study was undertaken in an attempt to discover, if possible, what factors affect the quality of ginning services in South Carolina. Its purpose was to assist farmers in choosing a ginner who can and will do a good job of ginning, and to aid gimmers in discovering what to do to improve their ginning services."

Data for 1941 were obtained by a survey of 49 gins located in 20 counties of the State. Some of the findings were: Of 29,392 bales ginned by the 49 gins 8.4 percent was reduced one or more grades because of gin damage. Ten percent of the gins accounted for 47 percent of the gin-damaged cotton, and one-fifth of the gins for two-thirds of the damaged cotton. A high percentage of rough ginning was done in gins operated by merchants and a low percentage in those operated by oil mills. There was no consistent relationship between experience of gin managers and quality of ginning. Experience of the ginner and quality of ginning were related. The gins with the highest and lowest volumes of output had the lowest percentage of gin damage. In general, there was a relationship between age of gin stands and quality of ginning. Gins with driers usually did the better ginning. The relationship between cleaning equipment and quality of ginning was not so obvious.

American tobacco types, uses, and markets, C. E. GAGE (*U. S. Dept. Agr. Cir. 249, rev. (1942), pp. 129, pl. 1, figs. 45*).—This revision (E. S. R., 68, p. 843) brings the tables, charts, and other data up to 1940 in most cases. Some sections are somewhat enlarged and new data added.

Market classes and grades of livestock, L. B. BURK and C. V. WHALIN (*U. S. Dept. Agr. Bul. 1360, rev. (1942), pp. 30, figs. 13*).—This completely revised bulletin (E. S. R., 55, p. 562) outlines and briefly explains the United States standards for market classes and grades of cattle, calves, swine, and sheep and lambs, and defines or discusses the standard market terms associated with such classes and grades.

Trucking milk to Providence, Rhode Island, A. MACLEOD, J. L. TENNANT, and W. J. CORR, JR. (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, pp. [3]+31, figs. 3; also [Rhode Island Sta. Misc. Pub. 11 (1942), pp. [3]+31, figs. 3]*).—This contribution to the regional program of research in milk marketing sponsored by the New England Research Council on Marketing and Food Supply describes the trucking of milk to Providence as of May 1941 and discusses the problems affecting milk hauling and charges in the Providence milkshed. Data are presented as to the number of truck routes, size of trucks, mileage traveled per day, charges, estimated costs of operations, etc. A reorganized system of truck routes is outlined, and estimates made of the number and size of trucks needed, mileage that would be traveled, costs, etc. An appendix contains data as to the cost of operating motortrucks, published by the [Connecticut] Storrs Experiment Station (E. S. R., 87, p. 873).

In May 1941 there were 50 commercial milk routes, the trucks traveling 4,017 miles and the rate charged averaging 34.4 ct. per hundredweight of milk. Under the reorganized system the number of trucks would be reduced to 25 large and 6 smaller trucks. It would reduce the total distance traveled to 2,258 miles and the estimated average cost per 100 lb. of milk to 20.7 ct. Of the reduction in cost, truck operation accounted for less than one-third and the balance would result from the elimination of unnecessary profits, reduction of "services" other than hauling milk, etc.

The grain milling industry in Knoxville trade area, C. E. ALLRED, B. H. LUEBKE, and M. B. JOHNSON (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 142 (1942), pp. IV+29, figs. 9*).—"This report deals with the functions, buying problems, operating problems, and efficiency of mills, in relation to possible greater service to farm communities." It is based on data secured in the summer and fall of 1941 by visits to 45 mills in 23 counties. It describes and discusses the types, location, and milling capacity of the mills, the grain storage facilities, the competition for grain supplies and the problems of procurement, the mill equipment, and the mill efficiency and possibilities.

Marketing the Illinois peach crop, V. A. EKSTROM (*Illinois Sta. Bul. 492 (1942), pp. 273-320, figs. 16*).—The peach industry of the United States and of Illinois is described. The competition of Illinois peaches with those of other States and the outlook for the peach industry in Illinois are discussed. The harvesting, preparation for market, and methods of transporting the Illinois crop to market are also described and discussed. Some analysis is made of the proportion of the crop shipped by truck, kinds of truckers, kinds of markets to which the crop is trucked, and length of truck hauls.

Surveys of 126 growers in 1938 and 192 growers in 1939 showed that 63 and 80 percent, respectively, of the crops were shipped by truck. Of 361 truckloads included in the 1939 survey, 60 percent moved 201 to 450 miles. A special survey in August 1942 showed for the 240 trucks included that the estimated period before replacement of the poorest tire was under 3 mo. for 33.8 percent of the trucks, from 3 to 6 mo. for 25.4 percent, and that "only 18 percent of the trucks

will probably be in condition for hauling Illinois peaches in 1943 if the tires are used meanwhile at the same rate as in 1941 and are not replaced."

An economic study of commercial fruit and vegetable canneries in South Carolina. J. M. STEPP (*South Carolina Sta. Bul. 342 (1942), pp. 55, figs. 15*).—This is a companion bulletin to the one on community canneries in the State (E. S. R., 87, p. 441.) All (20) of the commercial canneries were visited, and records were obtained regarding the facilities and operation of each cannery. Vegetable and peach production in the State is described. The types, locations, organization and ownership, capital investment, indebtedness, etc., of the canneries; the quantities of different fruits and vegetables canned; the length of the canning season and the quantity of different products canned in 1940; the sources of, prices paid for, and methods of purchasing raw materials; labor utilization; and the marketing of canned goods, including sales outlets, destination of shipments, and transportation are among the topics discussed.

The 20 canneries were located in 14 counties and were operated by 13 firms. The 18 canneries for which data were available canned 339,356 No. 2-equivalent cases in 1940, but had a total capacity of 1,473,629 cases. The total volume of raw materials processed was approximately 8,000 tons, and the total value was about \$112,000. "With every cannery of fruits and vegetables in the State operating at its normal level of output, employment in 1940 would have been somewhere between 941 and 1,272 workers." The average value of products was \$1.453 per case, and the cost per case was \$1.383, consisting of raw products 31.9 ct., cans and cases 53.6, labor 20, miscellaneous variable costs 15.5, and fixed costs 17.3 ct.

Selling fresh fruits and vegetables cooperatively. J. H. HECKMAN (*U. S. Dept. Agr., Farm Credit Admin. Bul. 49 (1941), pp. VII+78, figs. 16*).—"The purpose of this study is to present a general picture of the selling methods used by cooperative associations handling fresh fruits and vegetables during the period 1928 to 1938. It will discuss the variations among associations in marketing practices for different classes of commodities and for different types of buyers. It also will deal with the many changes that have occurred in the distribution of fresh fruits and vegetables within the last few years. These changes include developments in transportation, refrigeration, mass-buying, and other important factors which have brought about modifications in the sales programs of cooperative associations marketing perishable products." The data, which cover 100,737 car equivalents for the years 1928, 1933, and 1938, were obtained from 55 cooperative associations in 26 States. The sales practices—methods of sale, types of sales, types of buyers, etc., are described and discussed for fruit and vegetable, fruit, vegetable and potato, potato, vegetable, western fruit, peach, and strawberry associations. Another section deals with sales policies—working relations with buyers, future sales, time of sale, pricing, pooling, billing and collecting, development of trade territory, etc. Buyer practices when purchasing from cooperatives—purchase methods, purchase types, and methods of transportation—are also described.

Dehydration of fruits and vegetables by farmers' cooperative associations. H. C. HENSLEY (*U. S. Dept. Agr., Farm Credit Admin., 1942, WC 1, pp. [2]+54, figs. 54*).—The activity of cooperatives in the production of dried fruits and vegetables is briefly discussed. Desirable location and size and type of dehydration plants are discussed. The equipment for and procedures of cabinet, tunnel, drum, spray, and rotary types of dehydrators and vegetable preparation are illustrated with photographs. The prospects for post-war demand for dehydrated foods are briefly discussed. Maps are included showing the major vegetable areas in the United States. Copies are included of (1) Information

Sheet on Dehydrated White or Irish Potatoes and (2) Tentative FSCC Specifications for White (or Irish) Potatoes, Dehydrated.

Foreign Agriculture, [October 1942] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 6 (1942), No. 10, pp. [2]+343-364, fig. 1*).—Included are articles on The Agricultural Resources of Mozambique, by B. Merdian (pp. 343-358), describing the climate, vegetation, population, and economy of the Colony and discussing the factors affecting agricultural development, the present and potential agriculture, and the foreign trade; and Britain Creates Central Planning Authority, by M. Ogdon (pp. 359-364), describing the Ministry of Works and Planning Bill passed by the House of Commons on June 2, 1942, and the functions of the new Ministry.

The agricultural resources of Madagascar, B. MERDIAN (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr. Rpt. 7 (1942), pp. [2]+21, figs. 6*).—The people, the physical factors affecting the agricultural development, and the foreign trade are discussed, as are also the extent of the agricultural industry, the surplus food produced, the crops grown for export, and the forest products.

The International Wheat Agreement (*U. S. Dept. Agr., Off. Foreign Agr. Relat., 1942, pp. [1]+32*).—This report was prepared by the Washington Wheat Meeting, July 1941-June 1942. It includes the announcement, July 2, 1942, by the Governments of Argentina, Australia, Canada, the United Kingdom, and the United States of the memorandum of agreement, the memorandum, the draft convention, the minutes of the final session of the meeting, notes of approval by the Governments, lists of all delegates and aides, and the organization of the International Wheat Council. A statement prepared by G. P. Boals (pp. 21-31) on the significance of the agreement is also included.

RURAL SOCIOLOGY

The social economics of agriculture, W. GEE (*New York: Macmillan Co., 1942, rev. ed., pp. XII+720, figs. 10*).—This is a revision of the first edition (E. S. R., 68, p. 633).

[Investigations in rural sociology by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1941], pp. 55-57*).—Topics discussed include the European immigrant in rural Rhode Island and land use and rural living on the urban margin (coop. U. S. D. A.).

The physical status and health of Farm Security clients in southeast Missouri.—Preliminary Report No. 1, Results of blood tests for hemoglobin, C. E. LIVELY. (Coop. U. S. D. A. et al.). (*Missouri Sta., 1942, pp. [1]+9, fig. 1*).—One in 3 of the 1,667 whites examined showed less than 80 percent hemoglobin and more than 3 in 5 of the 992 Negroes examined fell below 80 percent. The whites had a definitely smaller proportion under 60 percent and under 70 percent than the Negroes. On the other hand, the whites placed $2\frac{1}{3}$ times as many as the Negroes at 90 percent or above.

A smaller proportion of males than females were suffering from secondary anemia. "With respect to age, it may be said that those persons aged 45 or over were in better physical condition with respect to blood hemoglobin than either of the groups aged 10-24 or 25-44. The youth group, those aged 10-24, showed the poorest record in this respect."

The physical status and health of farm tenants and farm laborers in southeast Missouri.—Preliminary Report No. 2, The physical defects of adult males, C. E. LIVELY and H. F. LIONBERGER. (Coop. U. S. D. A. et al.). (*Missouri Sta., 1942, pp. [1]+21, figs. 11*).—Diseases of the digestive system accounted for 44.6 percent of all defects found among the 1,115 males examined. This study revealed that the male population examined possessed relatively good

teeth, but there was evidence that dental care was inadequate. More than a third (35.2 percent) were in possession of a full set of teeth. The corresponding percentages were 34.7 for whites and 36.1 for Negroes. Of all the males examined, 34.8 percent had either gingivitis or pyorrhea; 14.6 were found to possess hernias, so defined as to include enlarged rings. Fourteen cases of ulcers of the stomach and intestines were found among males aged 25 yr. or over. Ten of these cases were among whites. Diseases and defects of the respiratory system accounted for 21.2 percent of all physical defects. Defective tonsils were found in 54 percent of both whites and Negroes. Of all white and Negro males between the ages of 15 and 24 yr., 71 percent had defective tonsils, as compared with approximately 40 percent of those aged 45 or over. Defects of the nasal fossae, most of which were deviations of the nasal septum, were found in 47 percent of the whites and 23 percent of the Negroes. Less than 3 percent of the total group of males examined had adenoids. Approximately 2 percent of the white and Negro males had sinusitis. All of the 17 cases of pulmonary emphysema were found among males above the age of 25 yr., with 14 cases occurring after the age of 45. Sixteen of the cases occurred in the white population.

For every 100 males examined, 18 cases of diseases of the eyes were found. Negroes placed fewer cases at all ages than did the whites, although the difference after age 44 was slight. Defective hearing was found to be three times as prevalent among the white males examined as among Negro males, with 2.3 percent of the whites and 0.7 percent of the Negroes so classified. Twenty cases of anemia, obesity, goiter, and diabetes per 100 white males examined and 51 cases per 100 Negro males examined were found to occur. It was found that 41.8 percent of the Negroes and 14.4 percent of the whites were suffering from secondary anemia. The status of numerous other relatively minor ailments is also presented.

The physical status and health of farm tenants and farm laborers in southeast Missouri.—Preliminary Report No. 3, The physical defects of adult females, C. E. LIVELY and H. F. LIONBERGER. (Coop. U. S. D. A. et al.). (Missouri Sta., 1942, pp. [1]+28, figs. 10).—This report dealt with the physical defects found among 1,064 females (670 white and 394 Negro) aged 15 yr. and older. Of these 32 percent were attributed to diseases and defects of the digestive system, with 84 percent of these accounted for by defective conditions of the teeth. Both whites and Negroes showed 210 such defects per 100 persons. Of other diseases and defects, the relative proportions for whites and Negroes were respectively as follows: Urogenital 21.3 and 19.8; respiratory 14.7 and 11.5; nutrition and endocrine gland 10.8 and 14.8; circulatory 9.3 and 9.5; organs of perception 13.5 and 7.5; and others 3.1 and 4.6 percent.

Culture of a contemporary rural community: Sublette, Kansas, E. H. BELL. (U. S. Dept. Agr., Bur. Agr. Econ., Rural Life Studies No. 2 (1942), pp. [4]+113, figs. 10).—This is a report on another of the six communities studied contemporaneously as to community stability during 1940 (E. S. R., 88, p. 271). Many of the data are presented on a county basis for Haskell County, southwestern Kansas.

Community organization for war and for peace, D. SANDERSON. (Cornell Univ.). (Social Forces, 21 (1942), No. 1, pp. 1-7).—The author concludes that community planning must be the foundation of any sound system of planning for larger units. Community organization will become increasingly necessary if we are to prosecute this war successfully, and it will be equally necessary after the war if we are to win the peace.

FOODS—HUMAN NUTRITION

Food and beverage analyses, M. A. BRIDGES and M. R. MATTICE (Philadelphia: Lea F. Febiger, 1942, 2 ed., rev., pp. 344).—These tables, now in the second edi-

tion, bring together data from many sources bearing on the proximate, mineral, and vitamin content of foods and beverages, including not only natural foods but also special food products, designated by trade names, and certain prepared foods. The data are presented to indicate the percentage composition of the foods as well as the amounts of the specific nutrients in average serving portions. Various classifications of foods, for example, according to carbohydrate, protein, or fat content, and brief discussions concerning the minerals and vitamins in foods are included. New data in this edition include "tables on the acidity of foods, their fiber content, the occurrence of sulfur, bromine, calcium, oxalate, phytins, purines, available carbohydrates, and ionizable iron. The reaction of foods is covered by a table of pH values which embodies all the common and many uncommon foods. There is a table of organic acids in fruits, vegetables, and a few miscellaneous items. Extensive information is given on the acid-ash and alkaline-ash factors." It is pointed out that this book is not intended as a source of material for the scientist in the field of nutrition, but as material for convenient reference of dietitians, nurses, etc. An extensive bibliography to the source material used is appended.

The nation's food. IV, Cereals as food. III, The chemical composition and nutritive value of oats and oatmeal, II. C. MOIR (*Chem. and Indus.*, 61 (1942), No. 2, pp. 17-21).—This summary presents data from many sources on the proximate composition of oats and oat products. A few data on mineral content, on the constitution of the protein, on the physical and chemical constants of oat oil, on enzyme activity, and on thiamin content are also given. The nutritive value of oats is discussed in the light of these data.

Cereal cellulose, a roughage material suitable for experimental animal diets, E. R. HARDING (*Science*, 95 (1942), No. 2461, p. 234).—A cereal cellulose, derived from rice hulls by a high-pressure chemical process of treatment together with extensive washing, is reported to have been satisfactorily used at a 5-percent level for roughage in animal diets. The product contains no protein (0.043 percent N) or fat, is devoid of thiamin, riboflavin, and P and contains only 0.022 percent Ca, an amount so low as to permit of use in ordinary studies of this element. The material is unsuitable, however, for use in diets designed to study Fe availability, since the Fe content amounts to 0.001 percent, due to the material being dried in a steel rotary drier. The cellulosic ingredients include 70 percent α -cellulose, with the rest made up of simpler celluloses and hydrocelluloses. It is noted that the cereal cellulose is to be made available through one of the larger scientific supply houses.

Modern bread from the viewpoint of nutrition, II. C. SHEERMAN and C. S. PEARSON (*New York: Macmillan Co.*, 1942, pp. VI+[2]+118).—It is pointed out that the developments within the past century in wheat production, milling, and baking have resulted in a highly developed technologically standardized staple white bread which is not much different from the breads of a decade or a century ago in the matter of energy value (about 1,200 calories per pound), but which is an impoverished product from the standpoint of protein, mineral, and vitamin values. Whole-wheat bread, bread made with skim milk powder, and bread which contains a significant proportion of wheat germ have a more satisfactory protein value than a bread made from white flour and water. The calcium value is raised by the milk now commonly used in bread making or by calcium enrichment of the white flour. Improvement in the iron value of bread may be attained by iron enrichment of the white flour, by the use of whole-wheat flour, or by the use of flours specially milled so as to be freed from the very coarse portion of the wheat, a roughage portion that might be irritating to some people, and yet to retain practically all of the nutrients rejected in the making of white flour. Vitamins of the B group may be re-

tained by the use of whole-wheat flour or of long extraction flours, or may be replaced by the incorporation of wheat germ or by the use of milk solids and vitamin-rich yeast. Breads nutritionally modernized in any of these ways justify larger use in the diet than nutritionally impoverished bread. It is believed that the nutritionally improved breads can now safely be utilized to supply as much as 40 percent of the calories of the normal diet, and that this more prominent place will frequently be physiologically, as well as economically, advantageous.

Use milk, an essential food (*Nebraska Sta. Cir.* 71 (1942), pp. 15, figs. 4).—This publication, pointing to the value of milk in reinforcing the diet with many excellent food nutrients, furnishes information on ways to utilize more milk in the home and especially the farm home. Consideration is given to the handling of milk in the home; to the use of milk for drinking and cooking and in frozen desserts (for which several recipes are given); to the use of cream; the use, making, and storing of butter; and the making of various cheeses.

Is there need for the fortification of milk? E. V. McCOLLUM (*Amer. Jour. Pub. Health*, 32 (1942), No. 1, pp. 80-84).—Because there is no advantage in making any single food a complete food; because it is more advantageous for a family to buy more ordinary milk than to buy a lesser volume of so-called "improved" premium milk; because publicity necessary to create demand for a fortified milk would do a disservice to the consumer by creating the impression that ordinary milk may not be after all the superior food, the economical purchase, and the best single supplementary article of diet among the protective foods; and because fortification of milk other than with vitamin D would impose the burden of added official supervision and inspection—because of all these considerations, it is concluded that it is unwise to permit fortification of milk other than with vitamin D.

Staphylococci and Salmonella control in foods, I-IV (*Food Res.*, 7 (1942), Nos. 1, pp. 1-15, figs. 2; 2, pp. 96-103).—Four papers are presented.

I. Effect of ultra-violet radiation and ozone on bakery custard and cream fillings, W. H. Cathcart, R. E. Ryberg, and A. Merz (pp. 1-9).—When custard products were exposed for various intervals to an atmosphere of the test organism, both with and without simultaneous exposure to ultraviolet radiation or to an atmosphere of ozone, the ultraviolet rays (2,000-2,950 a. u.) served only as an aid in maintaining a sterile atmosphere and were of no value in sterilizing products contaminated before the bacteria were killed. Ozone in the concentration in which it could be used had a low rate of killing and was ineffective in helping to control the staphylococci and the *Salmonella* bacteria in custard and cream fillings. An off-aroma developed in samples exposed to ultraviolet radiation for 2 hr. or more or to the atmosphere of ozone.

II. Effect of pure fruit fillings, R. E. Ryberg and W. H. Cathcart (pp. 10-15).—Custard fillings with additions of ground fruit thoroughly mixed and cooked with the rest of the mixture were inoculated with known numbers of the test organisms and incubated 24 hr. at 98°-99° F. The growth of the organisms in this period was found to be effectively inhibited in lemon, orange, pineapple, apricot, and strawberry fillings of the type described. This inhibitory action appeared to be greater on the *Salmonella* organisms than on the staphylococci, the amount of inhibition being at least partially controlled by the pH of the filling but also determined in part by a relationship between the pH and the types of acids or other substances present. The addition of milk reduced the inhibitory action, probably because of the buffering effect. The concentration of lemon juice required to exert an inhibitory effect was so high as to make the flavor of the resultant custard unsatisfactory.

III. Effect of chocolate and cocoa fillings on inhibiting growth of staphylococci,

W. H. Cathcart and A. Merz (pp. 96-99).—The growth of *Staphylococcus aureus* in chocolate and cocoa fillings inoculated with the organism was observed. Water rather than milk was used in the formula of the mix, which was varied by the use of different kinds and quantities of chocolate or cocoa and by the use or omission of egg yolks. The fillings made with the natural chocolate or cocoa were found effective in inhibiting growth of *S. aureus* in comparison with a standard custard. The effectiveness of the chocolate and cocoa was greatly increased by eliminating eggs from the formula. The inhibitory action was assumed to be due in part to the pH of the filling, but the main inhibitory action appeared to be due to the nonfat portion of the chocolate or cocoa.

IV. *Effect of cooking bakery custards*, W. H. Cathcart, A. Merz, and R. E. Ryberg (pp. 100-103).—A bulk custard made by a standard formula was inoculated with the test organism (*Staphylococcus aureus* or *Salmonella enteritidis*) by adding the prepared culture of known bacterial content to the thickening mix and bringing the batch to a second boil, where it was held for the desired length of time. In other tests the uncooked inoculated custard mixture was filled into raw pie shells, the pies then being baked for 25-35 min. at 246° C. Bacteriological examination of the cooked custards showed that they were rendered sterile of the test organisms in the one case by merely bringing to the second boil and in the other case by the baking. Since the experiments were conducted under commercial conditions with aseptic precautions, it is expected that properly prepared custards in normal practice will be essentially sterile with respect to these two organisms.

Production of staphylococcus enterotoxin in canned corn, salmon, and oysters, E. DAVISON and G. M. DACK (*Food Res.*, 7 (1942), No. 1, pp. 80-84).—From the studies described, it is concluded that "certain staphylococci can elaborate enterotoxin in experimentally inoculated cans of corn and of oysters. This was demonstrated by intravenous injection of monkeys and feeding of human volunteers. We were unable to demonstrate staphylococcus enterotoxin in inoculated canned salmon. The salmon was assayed by intravenous injection into monkeys and by feeding of human volunteers. Concentration of enterotoxin from foods by precipitation from saturated $(\text{NH}_4)_2\text{SO}_4$ solution can be accomplished, but it does not give a high enough percentage of positive results to be used as a practical routine method of assay."

Home canning, W. V. CRUESS and A. W. CHRISTIE, revised by W. V. CRUESS (*California Sta. Cir.* 276, rev. (1942), pp. 48, figs. 15).—This revision of an earlier publication (E. S. R., 51, p. 808) describes and summarizes approved canning methods for fruits, vegetables, and meat, and gives general information on the principles of canning and vitamins in canned foods. A section on food poisoning, by K. F. Meyer and J. C. Geiger, is also included.

[**Food preparation and vegetable studies**], D. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 10, p. 2).—Progress is reported on a survey of methods of food preparation among owner and cropper white and Negro families in two counties of the State, and on laboratory studies of losses of vitamin C in various methods of storing and cooking turnip greens.

[**Studies in foods and nutrition by the Ohio Station**] (*Ohio Sta. Bul.* 617 (1940), pp. 40, 55, 60).—Progress reports (for 1938-39) are given on a study of the vitamin C content of muskmelons (p. 40), the antigraying factor for rats (p. 55), and the food needs of young adults (p. 60) (E. S. R., 83, p. 562).

[**Nutrition studies by the Rhode Island Station**] (*Rhode Island Sta. Rpt.* [1941], pp. 49-51).—Progress is reported on a continuation of studies (E. S. R., 85, p. 853) on vitamin A metabolism of human subjects and nutritional status with respect to vitamin C.

Annual review of physiology, IV, edited by J. M. LUCK and V. E. HALL

(Stanford University, Calif.: Amer. Physiol. Soc. and Ann. Rev., Inc., 1942, vol. 4, pp. VIII+709, figs. 2).—Among the 23 reviews comprising this publication (E. S. R., 86, p. 856), the following deal with topics of nutritional significance: Developmental Physiology, by H. L. Hamilton and B. H. Willier (pp. 67-88); Water Metabolism, by J. P. Peters (pp. 89-114); Growth, by G. S. Avery, Jr. (pp. 115-138); Energy Metabolism, by W. H. Chambers, E. Shorr, and S. B. Barker (pp. 139-170) (Cornell Univ., Univ. Texp., et al.); Blood, by H. P. Smith (pp. 245-272); The Digestive System, by E. J. Van Liere (pp. 273-296) (W. Va. Univ.); and Metabolic Functions of the Endocrine Glands, by C. N. H. Long (pp. 465-502).

The evaluation of nutritional status, E. N. TODHUNTER (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 2, pp. 79-82).—A summary, with 20 references to the literature, of recent progress in the development of methods for evaluating nutritional status, particularly with reference to individual nutrients.

Nutrition for national defense (a summary), V. PHILLIPS. (Wash. State Col.). (*Wash. State Col., Inst. Dairying Proc.*, 13 (1941), pp. 67-69).—This brief discussion of the problem of insuring adequate nutrition stresses the fact that the first requirement toward attaining higher nutritional standards is a better distribution of income. The second is a better distribution of food money among different types of food, in other words more intelligent selection of food.

Nutrition and national defense, R. M. WILDER (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 1, pp. 1-8).—In this address, delivered at the 1941 convention of the American Dietetic Association, the author summarizes evidence in the literature of the extent of precritical malnutrition in this country, including among others reports from the State agricultural experiment stations of Florida (E. S. R., 83, p. 274), Maine (E. S. R., 84, p. 696), Minnesota (E. S. R., 86, p. 555), Oregon and three other western stations cooperating in an investigation of ascorbic acid metabolism (E. S. R., 84, p. 424), and Pennsylvania (E. S. R., 86, p. 858).

Research in Army subsistence, R. A. ISKER (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 1, pp. 20-22).—In this address the author describes the work of the subsistence research laboratory of the Quartermaster Corps, U. S. Army, with special reference to the development of a field ration for the use of highly mobile units such as mechanized or parachute troops. The ingredients of the three units of the daily ration, having a net weight of 32.86 oz. and providing 3,726 calories, are listed, with individual weights and calories furnished.

The importance of nutrition in the prenatal clinic, J. H. EBBS and W. J. MOYLE (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 1, pp. 12-15).—Essentially noted from another source (E. S. R., 87, p. 593).

Infant nutrition: A textbook of infant feeding for students and practitioners of medicine, W. M. MARRIOTT, revised by P. C. JEANS (*St. Louis, Mo.: C. V. Mosby Co.*, 1941, 3. ed., rev., pp. 475, figs. [32]).—This book, originally written by W. M. Marriott, has been brought up to date in the present revision by P. C. Jeans, who points out that the purpose of the book remains the same, namely, to bring together such facts and ideas as have a practical bearing on infant nutrition and to present them in such a way as to make them useful to the practitioner and student.

Influence of diet on the uric acid excretion of young children, J. E. HAWKS and G. EVERSON. (Mich. Expt. Sta.). (*Amer. Jour. Diseases Children*, 62 (1941), No. 5, pp. 955-966).—In three long-time balance studies conducted with preschool children by the method noted previously (E. S. R., 77, p. 725), data were obtained on the urinary uric acid excretion. In the first two experiments the children were placed on a diet furnishing 3 gm. of protein per kilogram of body weight; later the protein was increased to 4 gm. per kilogram. In the third experiment the change in the diet involved a calorie increase of about

20 percent. The change from the 3- to the 4-gm. protein level increased the uric acid elimination in all cases, although purine-free protein (egg white and gelatin) caused a smaller increase than meat protein. There was a better correlation between the values of uric acid and ammonia than between uric acid and other urinary nitrogenous substances, suggesting that there was a relation between the production of uric acid and that of ammonia.

The iron requirement of children of the early school age, F. A. JOHNSTON and L. J. ROBERTS (*Jour. Nutr.*, 23 (1942), No. 2, pp. 181-193).—The procedure employed to determine the iron requirement of the children was that of finding the lowest iron intake required to produce and maintain a good hemoglobin level, namely, 13-14 gm. With this method in view, the plan of the present study involved the selection of subjects, 12 boys and 9 girls from 8 to 11 yr. of age, who had been living for at least 2 yr. in an institution where the diet was fairly uniform in order that their hemoglobin levels could be considered a product of that diet. On this institutional diet, which was good in all diet essentials, the total daily intake of iron averaged 12.6 mg. in the 2-week period at the beginning of the study in which aliquots of the food were analyzed. In general the intakes of the boys were higher than those of the girls. The hemoglobin levels and red cell counts were determined at the beginning of the study; the hemoglobin level of the 21 children then averaged 12.9 gm., with 19 of them between 12 and 14 gm., and the red cell counts averaged 4,160,000, with no significant differences between the sexes. At the end of the 2-week preliminary period, the children were matched in groups of 3, one child of each group being given a daily supplement of 4 mg. of iron, another 2 mg., and the third none. After iron supplementation had been continued for 7 mo., hemoglobin levels were again determined and the data examined to find the lowest intake that gave good hemoglobin levels. Such examination indicated that 11.4 mg. of iron per day, or 0.35 mg. per kilogram, sufficed to maintain good hemoglobin levels when the rest of the diet was adequate. The hemoglobins of children given the 2- or 4-mg. supplements over the 7-mo. period did not rise, indicating that the higher intake of iron was not needed. "It is possible also that lower intakes, had they been tried, might have been found to serve just as well."

Successful rearing of a second generation of mice on an artificial diet, L. K. ROGERS, L. W. McELROY, and G. R. COWGILL (*Science*, 95 (1942), No. 2460, pp. 203-204).—In this preliminary report the basal ration on which success was achieved is described qualitatively as consisting of "Labco casein, cerulose, Crisco, Osborne and Mendel salt mixture with added zinc carbonate, agar, wheat germ oil, and 3 percent rice polish filtrate factor II. This basal mixture was supplemented with cod-liver oil concentrate, thiamin, riboflavin, pyridoxin, nicotinic acid, calcium pantothenate, choline, *p*-aminobenzoic acid, and inositol. During the past month linoleic acid has been added."

Rate of hemoglobin regeneration in blood donors, W. M. FOWLER and A. P. BARER (*Jour. Amer. Med. Assoc.*, 118 (1942), No. 6, pp. 421-427, figs. 6).—Two hundred normal male subjects donating from 500 to 600 cc. of blood showed a drop in blood hemoglobin content varying from 1.2 to 4.4 and averaging 2.3 gm. per 100 cc. In 105 of these men in whom hemoglobin recovery was followed, the recovery periods ranged from 18 to 98 days, and the average time required for the blood hemoglobin to return to its original level was 49.6 days. The longer recovery periods were associated with a greater drop in hemoglobin and could not be correlated with the initial blood hemoglobin values. With a smaller donation there was a smaller drop in blood hemoglobin, and the recovery period was shorter. Hemoglobin was regenerated in the men at the rate of 0.049 gm. per 100 cc. In a group of 13 women donors the average drop in hemoglobin

was 2.2 gm. and the average daily increase in hemoglobin amounted to 0.04 gm. per 100 cc. Observations following subsequent donations suggested that these may be given with safety as soon as the blood hemoglobin has returned to its original level, but that an interval of 3 mo. should be allowed if the hemoglobin of the donor is not determined regularly. The rate of hemoglobin regeneration after subsequent blood donations did not seem to be slower than after the first donation.

"The administration of 1 gm. of iron and ammonium citrates per day increased the daily hemoglobin regeneration by 49 percent and shortened the recovery period from 49.6 to 35.2 days during the first period of its administration. It had progressively less effect after subsequent blood donations."

The concentration of the substance in blood which is stimulatory for *Lactobacillus casei* ϵ , R. E. FEENEY and F. M. STRONG. (Univ. Wis.). (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 961-962).—Fat-soluble preparations which simulate the stimulatory action of blood, as observed in the recovery of riboflavin added to blood by the method of Snell and Strong (*E. S. R.*, 82, p. 587), were obtained from beef and dog bloods by continuous ether extraction. Further purification, accomplished by partitioning between ether and water and between dilute alcohol and petroleum ether, gave preparations showing marked stimulation at a level of approximately 75 γ per 10 cc. of medium. This stimulatory effect indicated that the active material had been concentrated from 500 to 1,000 times.

The use of radioactive copper in studies on nutritional anemia of rats, M. O. SCHULTZE and S. J. SIMMONS (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 97-106, fig. 1).—Radioactive copper, ^{64}Cu , with a half life of 12.8 hr., was prepared, extracted, and concentrated, and the radioactivity counted, all by methods noted. This isotope, having properties suitable for physiological studies, was fed, in amounts of from 100 to 150 mg. per rat, in a small amount of milk to young rats made severely deficient in iron or copper on a milk diet. After from 24 to 48 hr. of copper therapy, the animals, which had been kept in metabolism cages, were sacrificed, and the distribution of the copper in the tissues was determined. The copper-deficient rats retained more of the single therapeutic dose of copper than did iron-deficient rats. In both types of animals only a small fraction of the copper fed was retained. The kidney, the liver, and the bone marrow showed the highest relative retention of copper. The entrance of therapeutic copper into the bone marrow of the copper-deficient rats was demonstrated.

The influence of nutritional supervision on dental caries, P. R. HOWE, R. L. WHITE, and M. D. ELLIOTT (*Jour. Amer. Dent. Assoc.*, 29 (1942), No. 1, pp. 38-43, fig. 1).—This investigation was concerned with the incidence of new caries in a group of 189 children from 3 to 12 yr. of age under the supervision of the medical-nutrition department of the Forsyth Dental Infirmary for Children for an average period of 3.3 yr. as compared with the incidence in controls, children who were also dental patients at the infirmary but who received no dietary advice. "A significant reduction was found to have occurred in the average number of new cavities per child per year in each age group of the supervised children as compared with the controls. The average decrease in new cavities for all age groups was 56 percent. These findings indicate that the progress of dental caries in children can be substantially reduced by an intensive educational program in nutrition."

Graying of hair produced by ingestion of phenylthiocarbamide, C. P. RICHTER and K. H. CLISBY (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 3, pp. 684-687, figs. 2).—Of 23 black rats given as their sole drinking water a solution of phenylthiocarbamide in increasing concentrations from 0.001 per-

cent at the beginning to 0.1 percent, representing daily doses increasing from 1.3 to 14.1 mg., all but one showed definite graying of the fur, beginning as early as 27 days and becoming very distinct after 58 days. In most cases the graying took place in essentially the same pattern, which is described and illustrated by photographs. In all instances the top of the head remained black. In 5 of the grayed rats which were given tap water in place of the phenylthiocarbamide solution, the hair turned black again over the entire body in the reverse order of the graying, the return of the color being complete in 83 days.

These findings are considered of particular significance as showing that graying may result from a positive factor in the diet, as well as from a deficiency of some factor, although the possibility is suggested that the phenylthiocarbamide may combine in the body with pantothenic acid or some other factor and thus produce an actual deficiency.

Recent advances in vitamin knowledge: Vitamins and microorganisms, E. N. TODD HUNTER (*Jour. Home Econ.*, 34 (1942), No. 2, pp. 109-112).—This review of the literature is presented under the headings microbiological assays, synthesis of vitamins by micro-organisms, and vitamin C and micro-organisms. A list of 16 references to the literature is appended.

Absorption, metabolism, and storage of vitamin A and carotene, with some remarks on the vitamin A requirement, T. K. WITH (*Köbenhavn (Copenhagen): Einar Munksgaard; London: Humphrey Milford, 1940, pp. VIII+263*).—This work, translated from the Danish by H. Andersen, presents details of studies carried out in the State Vitamin Laboratory, Köbenhavn (Copenhagen), in 1937-39. The scope of the work is indicated by the chapter headings as follows: Chemistry of vitamin A and the carotenoids, structure of vitamin A and the carotenoids—its connection with their biological activity, comparison between biological estimation and chemical measurements of vitamin A—conversion of measured results and older vitamin A units to International Units, Carr-Price reaction of the carotenoids and its significance to chemical measurement of Vitamin A, technic of analysis, studies on the carotenoid and vitamin A contents of serum, studies on the excretion of vitamin A and carotenoids with feces, studies on the vitamin A content of the liver in man, studies on the absorption and conditions for depositing of vitamin A in the rat, studies on the vitamin A consumption of chicken embryos, and on the vitamin A requirement of man and warm-blooded animals. An extensive bibliography and protocols of the experiments are presented in separate chapters.

Vitamin-A and the biologically active carotenoids, R. F. HUNTER (*Chem. and Indus.*, 61 (1942), No. 8, pp. 89-94).—This review is concerned with the chemistry and the physiological activity of vitamin A and the members of the carotenoid group with which it is actively associated.

Changes of vitamin A distribution in choline deficiency, H. POPPER and H. CHINN (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 202-204).—Young rats placed on a low-choline, low-methionine, high-cystine diet supplemented with carotene and the crystalline vitamins developed fatty livers of varying degrees within from 2 to 10 days. Examination of the tissues for vitamin A under the fluorescence microscope or by chemical analysis showed the livers to be poor in vitamin A. The kidneys, showing characteristic hemorrhagic changes on about the sixth day, were extremely rich in vitamin A. In control animals, receiving 25 mg. of choline chloride daily, the livers were rich in vitamin A and the kidneys did not contain the excessive amounts of the vitamin.

An investigation of simple methods for diagnosing vitamin A deficiency

by measurements of dark adaptation, D. J. DOW and D. M. STEVEN (*Jour. Physiol.*, 100 (1941), No. 3, pp. 256-262, fig. 1).—This study, conducted on two well-nourished subjects in good health, was concerned chiefly with the relation between recovery times (the time required to perceive a field of constant brightness during dark adaptation following a period of light adaptation) and the final threshold of rod vision, as determined with the adaptometer and technique described by Steven and Wald (*E. S. R.*, 87, p. 313). The final rod thresholds did not vary with the individual tests and were identical for the two subjects, but the recovery times were less constant and unlike for the two. As the level of vitamin A nutrition was optimal for both, it is emphasized that there is no ground for stating that the longer recovery time indicates a poorer state of vitamin A nutrition, and it is concluded that although tests of the recovery time type will probably detect a severe case of night blindness, they are not sufficiently sensitive to give unequivocal data on the course of dark adaptation.

"In certain circumstances a 'recovery time' test may be of use. It may be important to measure the initial speed of dark adaptation of aviators, seamen, or other nocturnal workers. Such tests may be of value in these cases, especially when the complete course of dark adaptation is recorded also by an accurate method, but they must be considered ad hoc tests of the speed of dark adaptation and not a method of diagnosing vitamin A deficiency."

Vitamin B₁ (thiamine hydrochloride).—Annotated bibliography supplement (*Rahway, N. J.: Merck & Co., 1942, pp. [2]+62*).—A second supplement (*E. S. R.*, 86, p. 708), dated August 1942, to this bibliography (*E. S. R.*, 86, p. 423).

Studies of the average American diet.—1, **Thiamine content**, R. L. LANE, E. JOHNSON, and R. R. WILLIAMS (*Jour. Nutr.*, 23 (1942), No. 6, pp. 613-624).—This paper deals with the thiamin content of a series of diets formulated to contain all the more important foodstuffs of the American dietary, as indicated primarily by the compilation of Stiebeling and Phipard (*E. S. R.*, 81, p. 142), and in proportions corresponding to the annual per capita consumption of each. Representative samples of these foods, including cereal products, dairy products, meats, fats and oils, and vegetables and fruits, were analyzed for thiamin by the thiochrome method of Schultz, Atkin, and Frey noted on page 293. The figures for individual foods were used in calculating the thiamin content, per 2,500 calories, of the various diets formulated; these calculated values were checked by actual analyses of the various diet mixtures. The results showed that the thiamin content of the average American diet is about 0.8 mg. per 2,500 calories, and that the principal contributors of thiamin to the prevailing diets are lean pork, bread, and milk. It is estimated that universal substitution of enriched flour and bread for the corresponding unenriched products would increase the average thiamin intake about 64 percent to about 1.3 mg. per 2,500 calories.

Preliminary trials of the thiochrome method in comparison with the rat curative method indicated that the former tended to give low thiamin values for cooked flesh foods on account of incomplete extraction. This error was probably of significance, however, only in estimating the contribution of lean pork to mixed diets. It was also shown that flesh foods desiccated at low temperature by boiling with xylene gave thiochrome assay values that were much too low. The data presented on the thiamin content of foods as purchased would permit approximate calculation of thiamin yields of other diets as cooked and served.

Thiamin content of various milks, N. KENDALL (*Jour. Ped.*, 20 (1942), No. 1, pp. 65-73, figs. 3).—The method described for determining thiamin in milk involved incubation of the milk with takadiastase; oxidation of the thiamin to thiochrome by the addition of potassium ferricyanide, followed by sodium hydroxide; extraction of the thiochrome with isobutyl alcohol; and measurement

of the fluorescence of this solution in the fluorimeter. A blank, run with each specimen of milk, was treated similarly, except that the reagent was omitted, and the fluorescence, representing that of the reagents and of nonthiochrome substances in the milk, subtracted from that of the sample. The raw cow's milk tested contained from 41 to 48 $\mu\text{g.}$ of thiamin per 100 cc.; from 10 to 20 percent of the thiamin content was lost in pasteurization. The several samples of market milks tested contained from 35 to 40 $\mu\text{g.}$ of thiamin per 100 cc. Evaporation of milk appeared to destroy from 25 to 50 percent of the thiamin, since the 3 brands of evaporated milk tested contained but from 18 to 27 $\mu\text{g.}$ of thiamin per 100 cc. after reconstruction to simulate fresh milk. Most of the reconstructed dried milks assayed contained from 30 to 60 percent less thiamin than fresh cow's milk. Thiamin values for 63 specimens of human milk obtained from 32 women from 1 to 10 days post partum varied from 0 to 9 $\mu\text{g.}$ per 100 cc., the gradual rise occurring during the first few days of lactation.

The variability in the thiamin content of western Canadian hard red spring wheat of the 1940 crop, H. JOHANSSON and C. E. RICH (*Cereal Chem.*, 19 (1942), No. 2, pp. 308-313, figs. 3).—When 265 samples of hard red spring wheats taken from commercial car lots from shipping points in Manitoba, Saskatchewan, and Alberta were assayed for thiamin content by the modified thiochrome method of the authors (E. S. R., 87, p. 8), the values, expressed as micrograms per gram on a 13.5-percent moisture basis, averaged 3.93, with a range from 2.2 to 8.0. The means for each province were not significantly different, but the western part of the area showed a greater range in values. A map showing areas with wheats of similar thiamin content (at four different levels) indicated a random arrangement, with no relation to soil type. Areas according to thiamin distribution were found also to be unrelated to areas based on the ash and protein content of the wheat each produced.

The measurement and metabolism of thiamin and of a pyrimidine stimulating yeast fermentation found in the blood cells and urine of normal individuals, A. T. GORHAM, J. C. ABELS, A. L. ROBINS, and C. P. RHODES (*Jour. Clin. Invest.*, 21 (1942), No. 2, pp. 161-176, figs. 4).—The techniques used, which are described in detail, were adaptations of the fermentation method of Atkin, Schultz, and Frey (E. S. R., 83, p. 444). The average thiamin levels of the normal white cells was found to be about 10 times that of normal erythrocytes, a distribution similar to that of riboflavin and of ascorbic acid, as recently reported. It is suggested that this higher concentration may be explained by the fact that, of the several blood constituents, the white cells most closely resemble actively metabolizing tissue.

The intravenous administration of 5 mg. of thiamin to three female and two male adult subjects was followed within 3 hr. by increases in the levels of true thiamin in the cells, ranging from 80 to 132 and averaging 100 percent above their original values, and also by increases in PAYF (pyrimidines accelerating yeast fermentation), ranging from 41 to 180 and averaging 143 percent of the original level. With one exception, the values tended to return to base levels within 24 hr. The 24-hr. urinary excretion of both compounds was significantly increased by the test dose of thiamin. Similar injections of PAYF were followed within 3 hr. by a marked increase in the white cell level of PAYF, while there was an increase in thiamin in only one case within that time. The urinary excretion of PAYF after its intravenous administration was considerably less than after injection of the thiamin. That the excretion of PAYF cannot be explained by spontaneous decomposition of thiamin was shown by the demonstration that the administration of thiamin to a leukemia patient is not followed by any increase in the content of PAYF in the urine. It is concluded that in the course of its metabolic activity thiamin is probably broken down to the

pyrimidine compound. This is in line with the observations of Wertz and Mitchell (E. S. R., 87, p. 314).

Pathological variations in blood and spinal fluid pyruvic acid, E. BUEDIG, H. WORTIS, and M. STERN (*Jour. Clin. Invest.*, 21 (1942), No. 1, pp. 85-89, figs. 2).—In an effort to determine the clinical significance of pyruvic acid levels in blood and cerebrospinal fluid, determinations of both by methods previously described (E. S. R., 87, p. 603) were made on a group of 41 normal individuals and several groups of patients with various disorders.

Blood values for the normal subjects ranged from 0.77 to 1.23 mg. percent, with an average of 1.02, or well below the 1.30 mg. percent considered to be the highest normal level (E. S. R., 85, p. 852). In the various clinical groups tested, 45 out of 48 whose condition was classified as acute peripheral neuropathy and 22 of 35 with miscellaneous conditions accompanied by elevated temperature showed an abnormal elevation of both blood and spinal fluid pyruvic acid. Normal fasting levels in both blood and spinal fluid were found in cases of chronic peripheral neuropathy, chronic alcoholism without objective evidence of nutritional deficiency, various psychiatric and medical disorders, and certain cases with fever.

It is emphasized that a normal fasting pyruvic acid may not be an invariable evidence of thiamin adequacy. Occasional cases with normal fasting blood pyruvate have shown an abnormal pyruvate curve following glucose ingestion. "This suggests that the pyruvic acid curve following glucose ingestion may prove to be a more sensitive index of thiamin adequacy than the fasting blood pyruvic acid level."

The authors had the technical assistance of D. Esturonne.

Nicotinic acid, R. F. GRIGGS (*Science*, 95 (1942), No. 2459, p. 171).—Acceptance for popular usage of "Niacin" and "Niacin Amide" as synonymous with nicotinic acid and nicotinic acid amide is recommended by the food and nutrition board of the National Research Council. The committee which made the recommendation (C. A. Elvehjem, W. H. Sebrell, and T. D. Spies) also recommends, however, that the terms nicotinic acid and nicotinic acid amide be used in scientific literature, and that the new terms be used only where there may be objection from the public, as, for example, objection to the enrichment of bread with nicotinic acid which in the lay mind is confused with the poisonous alkaloid nicotine.

Studies on the urinary excretion of pantothenic acid, R. H. SILBER and K. UNNA (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 623-628).—Simultaneous determinations of pantothenic acid and riboflavin in the urine and blood of dogs during diuresis before and after oral and intravenous administration of calcium pantothenate and sodium riboflavin are reported. The 2-hr. excretion of two dogs before the administration of the calcium pantothenate contained an average in four experiments of 7.5 μ g. of pantothenic acid and 9.2 μ g. of riboflavin. After an oral dose of 1 mg. of calcium pantothenate per kilogram of body weight there was no significant increase in the excretion of the pantothenic acid, but when the dose was increased to 4 mg. there was a distinct increase which reached a peak at from 60 to 100 min. and amounted in 2 hr. to from 0.9 to 5.0 percent of the dosage. When the same doses were given by intravenous injection, from 22 to 31 percent of the 1-mg. dose was excreted in the urine, with the peak within 40 min., and from 41 to 57 percent of the 4-mg. dose with the peak within 20 min. One of the dogs was finally given 4 mg. per kilogram of calcium pantothenate and in another test the same amount of sodium riboflavin by intravenous injection, and the content of both pantothenic acid and riboflavin determined in the blood and urine at stated intervals for 2 hr. The blood level of pantothenic acid rose within 5 min. from 2.2 μ g.

to 26 $\mu\text{g.}$, but returned to normal within the 2 hr. The peak in urinary excretion occurred in 20 min. With riboflavin the blood level of riboflavin reached a peak in 11 min. and returned to nearly the original level in 2 hr. The peak in excretion occurred at 40 min. The administration of calcium pantothenate had no appreciable effect on blood or urinary riboflavin and vice versa. This is contrary to the report of Spies et al. (E. S. R., 85, p. 133) that intravenous injection of pantothenic acid in human subjects is followed by a temporary rise in the riboflavin concentration of the blood, and that similarly the injection of riboflavin produces an increase in the pantothenic acid content of the blood.

A supplementary growth factor for *Lactobacillus casei*, M. F. CLARKE, M. LECHYCKA, and A. E. LIGHT (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 957-958).—Rice polishings concentrate assayed for pantothenic acid by the method of Pennington et al. (E. S. R., 85, p. 442) promoted acid production by *L. casei* well beyond the amounts formerly considered maximum. The factor involved seemed to be present in two commercial yeast concentrates in much smaller concentration than in the rice polishings concentrate and to be absent from the yeast extract (Difco, Bacto) used as a component of the basal medium. The effect of increased acid production was not removed by one treatment of the rice polishings concentrate with fuller's earth at pH 4, and was only partially destroyed by incubation overnight at 50° [C.] with takadiastase, but was destroyed by autoclaving at 15 lb. for 30 min. in NaOH at pH 12.

Riboflavin.—Annotated bibliography supplement (*Rahway, N. J.: Merck & Co.*, 1942, pp. [2]+27).—A second supplement (E. S. R., 87, p. 151), dated September 1942, to this bibliography (E. S. R., 85, p. 703).

The quantitative relationship of riboflavin to cataract formation in rats, H. M. BAUM, J. F. MICHAELREE, and E. B. BROWN (*Science*, 95 (1942), No. 2453, pp. 24-25).—The inconsistency in cataract formation in rats fed on riboflavin-deficient diets, as reported by various observers, is explained as being due to differences in the freedom of the basal diet from riboflavin. The Bourquin-Sherman diet was found to contain enough riboflavin so that on the basis of average consumption the rats received 0.57 $\mu\text{g.}$ of riboflavin on the basal diet alone. When the vitamins of the B complex other than riboflavin were fed as the crystalline vitamins in place of the 80 percent alcoholic extract of the Bourquin-Sherman diet, only 14 percent of the animals contracted cataract as compared with 90 percent on the less highly purified Bourquin-Sherman diet. When the more highly purified diet was supplemented with from 1 to 3 $\mu\text{g.}$ of riboflavin, cataract developed. On another modification involving Crisco as a source of fat instead of filtered butterfat, none of the rats developed cataract. It is concluded that rats on a diet completely devoid of riboflavin do not develop cataract, and that minute amounts of riboflavin induce cataract, while rations containing more nearly adequate amounts are noncataractogenic.

Distribution of biotin and avidin in hen's egg, P. GYÖRGY and C. S. ROSE (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 294-298).—Quantitative determinations of biotin and avidin in whole egg in which the white and yolk were thoroughly mixed invariably showed an excess of avidin. This finding was confirmed by separate analyses of the white and yolk for free and bound biotin and for free and bound avidin. Determinations of the content of biotin in egg yolk subjected to various treatments suggested that biotin is present in egg yolk in combination with a larger molecule, probably a globulinlike constituent of the egg yolk. This compound was precipitated by cold distilled water (partly also by acetone), was soluble to a large extent in cold saline, and could be split, with simultaneous liberation of biotin, by steaming for a short time. The high molecular biotin compound was found to be nondialyz-

able. The bound biotin in egg yolk was physiologically available, however, to rats as well as to yeast.

Preliminary observations on "egg white injury" in man and its cure with a biotin concentrate, V. P. SYDENSTRICKER, S. A. SINGAL, A. P. BRIGGS, N. M. DEVAUGHN, and H. ISBELL. (Univ. Ga. et al.). (*Science*, 95 (1942), No. 2459, pp. 176-177).—This preliminary report describes briefly the production in four adults of signs and symptoms strikingly similar to those of spontaneous avitaminosis on a diet in which approximately 30 percent of the total calories was supplied by desiccated egg white and which was supplemented with thiamin chloride, riboflavin, nicotinic acid, pyridoxin, calcium pantothenate, ascorbic acid, vitamin A, ferrous sulfate, and calcium lactate. During the third and fourth weeks all of the subjects developed a fine scaly desquamation without pruritus, disappearing in from 7 to 10 days. No other skin disturbances developed until the seventh week, when one subject developed a maculosquamous dermatitis of the neck, hands, arms, and legs. During this and the following week, all of the subjects showed a pronounced gray pallor of the skin and atrophy of the lingual papillae. During the ninth and tenth weeks, the skin of all of the subjects became increasingly dry, with reappearance of the fine scaly desquamation. No ocular or genital lesions were observed. After the fifth week symptoms very similar to those of experimental thiamin deficiency appeared. The blood hemoglobin, erythrocytes, and volume of packed red cells decreased definitely, and there was a slight increase in bile pigments and a striking increase in serum cholesterol.

Treatment with an injectable biotin concentrate in doses of from 75 to 300 μ g. daily, administered in three aliquots, was successful at a level of 150 μ g. and above. The symptoms similar to those of thiamin deficiency disappeared in from 3 to 5 days and the ashy pallor of the skin in 4 days, and there was a reduction of serum cholesterol in 4 days. Immediately after the administration of 150 μ g. of biotin, the urinary excretion of biotin rose to about 55 μ g. and remained at that level until the dosage was increased to 300 μ g., when the excretion promptly rose to from 140 to 150 μ g.

Pathologic aspect of nutritional deficiencies in rats.—I, Lesions produced by diets free of vitamin B₆ (pyridoxine) and the response to vitamin B₆, W. ANTROPOL and K. UNNA (*Arch. Pathol.*, 33 (1942), No. 2, pp. 241-258, figs. 9).—This paper discusses in detail, with numerous photographs and microphotographs, the pathology and histology of the deficiency syndrome occurring in rats on diets free from pyridoxin, differentiating the specific from the nonspecific signs and symptoms, and the changes following administration of pyridoxin and other vitamins of the B complex. "The hyperkeratosis and acanthosis of the ears, paws, and snout, together with the edema of the corium, are considered characteristic of vitamin B₆ deficiency in rats."

Acido ascorbico (vitamin C) en 26 muestras de jugos de uvas [Ascorbic acid (vitamin C) in 26 samples of grape juice], H. P. TOMEIO IBARRA (*Univ. Repub. [Montevideo], Rev. Facult. Agron.*, No. 25 (1941), pp. 109-115).—Twenty-two of the samples were of Uruguayan origin and these contained from 1.3 to 4.7 mg. ascorbic acid per 100 cc.

Vitamin C content of fresh, canned, and dried guavas, L. GOLDBERG and L. LEVY (*Nature [London]*, 148 (1941), No. 3749, p. 286).—This is a preliminary report of results obtained with guavas from the Transvaal and Cape Province, Africa, analyzed for ascorbic acid by indophenol titration of a 2-percent metaphosphoric acid extract of the material. Fresh guavas, as whole fruit, at the green and hard, ripe and firm, and overripe and soft stages, contained, respectively, 250-350, 300-450, and 50-100 mg. of ascorbic acid per 100 gm. Varietal and regional variations were not wide, but white-fleshed guavas were

usually slightly richer in ascorbic acid than those with pink flesh. The concentration of the vitamin decreased from skin to outer pulp to inner pulp in the proportion 12:5:1. When firm ripe fruit was canned, the ascorbic acid in the canned product (fruit and juice) reached 200-300 mg. per 100 gm.; the use of soft fruit reduced the content to as low as 18 mg. per 100 gm. Pulping and overcooking also greatly reduced the vitamin content. Drying the fruit at low temperature most successfully preserved the ascorbic acid content. The procedure developed involved removal of stones and central pulp from the quartered unpeeled fruit, blanching of the residue for 2 min., followed by drying at 130° F. for from 10 to 12 hr., and powdering of the dried fruit. The powdered guava thus prepared contained 2,500-3,600 mg. per 100 gm. in the white varieties and 2,000-2,500 mg. in the pink-fleshed varieties. Failure to blanch the fruit resulted in lower values.

Further analysis of the rôle of ascorbic acid in phenylalanine and tyrosine metabolism, R. R. SEALOCK, J. D. PERKINSON, JR., and D. H. BASINSKI (*Jour. Biol. Chem.*, 140 (1941), No. 1, pp. 153-160, figs. 2).—Similar effects to those previously reported for *l*-phenylalanine (E. S. R., 85, p. 572) were obtained when phenylpyruvic acid was fed to vitamin C-deficient guinea pigs, but the feeding of the *p*-hydroxy derivative of phenylpyruvic acid under the same conditions resulted in the excretion of metabolites only slightly affected by the administration of ascorbic acid.

Effect of controlled ascorbic acid ingestion upon urinary excretion and plasma concentration of ascorbic acid in normal adults, C. A. STORVICK and H. M. HAUCK. (Cornell Univ.). (*Jour. Nutr.*, 23 (1942), No. 2, pp. 111-123, fig. 1).—In continuation of the authors' studies on vitamin C metabolism and requirements (E. S. R., 82, p. 428), two men and four women served as subjects for daily determinations after a preliminary saturation period of ascorbic acid in the blood plasma and in 24-hr. urines during 21 experimental periods of 28 days each on stated levels of ascorbic acid.

The mean daily urinary ascorbic acid excretions differed for the various subjects on the same intake. On 200 mg. the values for the women ranged from 154 to 164 mg., and the values for the two men were 135 and 130 mg. Similar variations occurred on the lower levels. The fasting plasma values were characteristic for each individual, with no characteristic sex differences. The mean values for the six subjects on the 200-mg. level ranged from 1.07 to 1.58 mg. per 100 cc. Although in general higher values were obtained on higher intakes of ascorbic acid than on lower, the range of values on each level was so wide as to indicate that a single plasma determination is of limited value as an index of vitamin C nutrition. Two criteria were used in estimating from the vitamin C content of the urine following test doses the minimum requirement for saturation—(1) the lowest individual response to a 400-mg. dose following a preliminary saturation period and (2) the excretion within 24 hr. of at least 50 percent of the test dose. According to (1), the daily requirements of the two men were 100 and 150 mg. and of three of the women 100+, 75, and 125+ mg. daily; corresponding values by criterion (2) were the same for the men and 90, 65, and 90 mg., respectively, for the women. These quantities were in addition to approximately 10 mg. of ascorbic acid in the basal diet.

The administration of vitamin C in a large institution and its effect on general health and resistance to infection, A. J. GLAZEBROOK and S. THOMSON (*Jour. Hyg. [London]*, 42 (1942), No. 1, pp. 1-19, figs. 3).—From observations on the diet and cooking practices at a training school for about 1,500 boys from 15 to 20 yr. of age and from vitamin C determinations on some of the foods eaten, it was estimated that while the diet was liberal in calories (over 4,000)

and contained good sources of vitamin C, prolonged cooking times and delays before serving reduced the total intake of ascorbic acid to from 10 to 15 mg. per student per day.

Following a single dose of 300 mg., none of 75 of the boys tested excreted appreciable amounts of ascorbic acid. The resting levels of excretion of the boys in the absence of a test dose ranged from 5.6 to 1.1 mg., with an average of 2.5 mg. per 24 hr. In attempts to saturate a group of 350 boys by adding sufficient ascorbic acid to the milk and cocoa to furnish a total intake (with that of the regular diet) of 200 mg., 8 days were required to bring the resting level of excretion to that of normal adults and 22 days to complete saturation. By adjusting the levels of intake following saturation, excretion levels considered normal were reached on 25 mg. of ascorbic acid twice daily. The same figure was reached in a group study in which 24-hr. urine samples were pooled.

The incidence of common colds and tonsillitis was the same over a period of several months in two groups of adolescents at the institution, one of which received large supplements of ascorbic acid and the other did not. The average duration of colds was the same in the two groups but of tonsillitis longer in the control than in the test group. Rheumatic fever and pneumonia occurred in the control but not in the test group.

The ascorbic acid requirements of children, O. A. BESSEY and R. L. WHITE (*Jour. Nutr.*, 23 (1942), No. 2, pp. 195-204, fig. 1).—The blood plasma ascorbic acid levels of 93 healthy city children receiving various amounts of ascorbic acid in their diet were plotted against the dietary intakes as calculated from dietary histories to locate the minimum intake which would give the average maximum post-absorptive blood plasma level.

Of the children who received 3 oz. or more of orange juice daily or an equivalent amount of ascorbic acid in citrus fruits and tomatoes, 80 percent maintained blood plasma levels of ascorbic acid indicative of a liberal intake. The amount of ascorbic acid available from other sources was considered to be insufficient to influence the blood plasma values. "This finding emphasizes the necessity of a regular consumption of citrus fruits or tomatoes if an optimal postabsorptive plasma value is to be maintained. Furthermore, it suggests that in taking nutritional histories the evaluation of the citrus fruit and tomato intake is a simple, practical, and accurate means of determining ascorbic acid consumption, at least as far as the optimum range is concerned."

Experimental vitamin P deficiency, S. RUSZNYÁK and A. BENKÓ (*Science*, 94 (1941), No. 2427, p. 25).—It is noted briefly that rats can be used to study vitamin P deficiency and the effectiveness of citrin preparations, for while rats do not develop signs and symptoms of vitamin C deficiency on an ascorbic acid-free diet, they do show lowered capillary resistance within 5 or 6 weeks, and this responds to treatment with from 3 to 4 mg. of citrin daily administered subcutaneously.

Dietary requirements for fertility and lactation.—XXX, **Role of p-aminobenzoic acid and inositol in lactation: Preliminary report,** B. SUBE. (Ark. Expt. Sta.). (*Science*, 94 (1941), No. 2433, p. 167).—In this preliminary report evidence is summarized confirming the suggestion made in the preceding report of the series (E. S. R., 87, p. 592) that p-aminobenzoic acid is essential for reproduction and lactation in the rat. Evidence is still inconclusive concerning inositol.

TEXTILES AND CLOTHING

The chemical analysis of fibre mixtures, F. HOWLETT, M. J. MORLEY, and A. R. URQUHART (*Jour. Textile Inst.*, 33 (1942), No. 6, pp. T75-T104, figs. 2).—Following an introductory review of published work on fiber analysis, it is

pointed out that the methods used, although accurate, have had too limited a field of applicability. "The present paper is an attempt to widen the field of use of a few chosen methods so as to include many more fibers, and to explain how far modern finishes can be dealt with. No one previous method has been accepted and modified, but from the well-known solubility data of the more common fibers a series of suitable treatments has been selected so as to cover most of the known fiber mixtures, the accuracy of the methods being greater than the certainty of accurately spinning the mixtures. The only mixture of possible importance that has not been considered is that of wool and casein." Information is given concerning the general principles of the methods selected, the technic and apparatus, and solutions required, and detailed consideration is given to experimental methods used and results obtained in separating and identifying pairs of fibers and triple mixtures. Fifty-four references are given.

A comparative study of four methods for the quantitative determination of wool in mixed fabrics, L. E. WEIDENHAMMER. (U. S. D. A.). (*Amer. Dyestuff Rptr.*, 31 (1942), No. 19, pp. 441-445).—The four methods, described briefly and including the caustic boil, aluminum chloride, sulfuric acid, and flotation methods, were applied to two wool and cotton and two wool and spun viscose rayon fabrics manufactured for experimental purposes and to two commercial blanket fabrics. Known mixtures prepared from all-wool, all-cotton, and all-viscose rayon fabrics, finely cut and intimately mixed, were also analyzed by the four methods. The results of the analyses were tabulated and the data analyzed statistically by the method of analysis of variance. The sulfuric acid method was found in general to give higher results than the other methods, which did not differ greatly among themselves. Except for the flotation method, the various procedures used had a high degree of precision. The caustic boil method was very accurate when the correction factor (necessitated because of the solution of some cellulosic material along with the wool fraction) could be accurately determined; in the present tests a correction allowing for about 1½ percent loss of cotton and 5 percent loss of rayon seemed to be about right. The aluminum chloride method tended to give results that were too low by about the same amount as the sulfuric acid results were too high. Calculations indicated that for routine analysis two samples were probably sufficient for any of the four methods. It is pointed out that the caustic boil method, while quick and convenient, requires the use of a correction factor, and that further work is needed to determine the extent to which various cotton and rayon materials are dissolved under the conditions of the test. The flotation test, although somewhat unreliable, has the advantage of requiring but a small sample and of permitting both components to be recovered. The aluminum chloride method, although precise and reasonably accurate, is tedious, time-consuming, and deleterious to operator and equipment. The sulfuric acid method, also precise and accurate, requires fairly large quantities of 70-percent sulfuric acid that may not be available during wartime.

An examination of the relation between wool quality and fibre diameter, J. L. STOVES (*Jour. Textile Inst.*, 32 (1941), No. 12, pp. T221-T226, figs. 3).—This is a review of published studies on fiber fineness and wool quality and on methods of measuring fiber diameter. Nineteen references are given.

Dependence of the indigestibility of wool protein upon its polymeric structure, W. B. GEIGER and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 29 (1942), No. 4, pp. 271-277, fig. 1).—"The resistance of wool to digestion by enzymes is probably due to a unique structure, consisting of peptide chains joined by disulfide cross links to form a three-dimensional polymeric network of extremely high molecular weight. This conclusion is substantiated by a study of a series of derived wool proteins similar in composition but expected

to differ in molecular weight. The proteins were prepared by first 'depolymerizing' wool by reducing its disulfide cross links to sulfhydryl groups, then making a series of solutions of this protein of widely varying concentration, and finally rebuilding the disulfide cross links by reoxidation. An investigation of the rates of digestion by pepsin of a series of such proteins showed that those preparations expected to be of low molecular weight were rapidly digested, whereas those expected to be of greatest molecular weight were almost as resistant to digestion as untreated wool."

A fiber identification stain, H. L. DAVIS and H. J. RYŃKIEWICZ (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 6, p. 472).—A stain containing acid fuchsin (Color Index No. 692) 6 gm., picric acid 10, tannic acid 10, and National Soluble Blue 2B Extra (Color Index No. 707) 5 gm., dissolved in hot water and made up to 1 l., was found to be a versatile and selective stain. Momentary immersion of the fiber in the hot stain or immersion for something over 2 min. for cold dyeing, followed by thorough rinsing, completes the test. With this stain, vegetable fibers, such as cotton or linen, are colored light blue. Of the synthetic fibers, acetate or Nylon is colored pale greenish yellow; cuprammonium, dark blue; viscose, lavender; and Vinyon, very pale blue. Of the animal fibers, wool is stained yellow; raw silk, black; and degummed silk, brown. Some dyed textiles may be identified without previous bleaching by treating with the stain in the usual way, rinsing, and pressing while wet between absorbent papers. A dye mixture characteristic of the color which would have been shown by the undyed fibers is transferred to the papers. The stain is also useful in the identification of films of cellulose acetate or viscose (Cellophane).

Cloth strength testing (*Jour. Textile Inst.*, 33 (1942), No. 6, pp. S7-S39, figs. 2).—Reports by members of the general technical committee A (physical testing) of the standardization section of the Textile Institute [British] are presented as follows: Introductory Review of the Committee's Work (pp. S7-S8) and Note on the Variability of Tensile Strength Tests on Cotton Fabric (pp. S22-S23), both by A. W. Bayes; Comparison of Fabric Tensile Test Results Obtained in Different Laboratories, by B. D. Porritt, J. R. Scott, and W. H. Willott (pp. S9-S21); Some Theoretical Notes on the Constant Rate of Traverse Pendulum Type Cloth Tester, by J. G. Martindale and H. J. Woods (pp. S24-S33); The Measurement of Machine Rate of Load on Constant Rate of Traverse Type Cloth Testing Machines, by J. G. Martindale (pp. S34-S37); Methods of Calibrating Textile Strength Testing Machines, by E. Bowen (p. S38); and Method of Calibration of Horizontal Pendulum Type Fabric Tensile Testing Machine, by N. Goodbrand (p. S39).

The breaking strength of fabrics, P. LAROSE (*Jour. Textile Inst.*, 32 (1941), No. 9, pp. T167-T178, figs. 7).—Data showing the relation between the grab test and the strip test are presented, and a new test method possessing the advantages of the strip and grab methods is proposed. This test, designated tentatively as the "half-grab" test, "consists in taking a strip of cloth 2 in. wide and raveling only one side of it by removing a few yarns so as to leave a well-defined edge and protruding cross yarns as in the ordinary strip test. The strip is placed in the test machine fitted with jaws 1 in. wide so that the raveled edge is in line with one side of the jaws, as illustrated. On the other side, the strip will extend beyond the jaws for about 1 in. The advantages claimed for this method are that less material is required than for the grab test, perfect alignment of the yarns in the jaws is possible, thus increasing the reliability and accuracy of the results, and at the same time the preparation of the sample involves less work than for the strip test, since only one side is raveled and no measurement of width is necessary." Results

presented for tests by the three methods show that not only is the strip test more accurate on the whole than the grab test, but that the half-grab test is even more reliable. A correlation is worked out by statistical methods showing that a direct relation exists between the breaking strength results obtained by means of the strip method and those by one of the other two methods.

A service study of three blanket fabrics made from various blends of wool and mohair. R. E. ROGERS, M. B. HAYS, and J. I. HARDY. (U. S. D. A.). (*Amer. Dyestuff Rptr.*, 31 (1942), No. 13, pp. 318-324, fig. 1).—"Blankets were manufactured from good-quality new Corriedale wool blended with new Corriedale wool of poor quality, with reworked wool, and with mohair. They were put into use in a Government hospital, and test blankets were withdrawn from service at intervals in order to measure the deterioration due to wear and laundering. As measured by laboratory tests throughout service, the fabrics would rate in general in the following order of decreasing use value: Fabric 1, all new wool; fabric 3, containing new mohair; and fabric 2, containing reworked wool. The differences between fabrics, however, are small, and in heat transmission these differences are not even mathematically significant. An analysis of variance shows that fabric 1, containing poor-quality new wool, differs significantly from fabric 2, containing reworked wool, as measured by filling breaking strength both strip and grab, warp strength as determined by the strip method, air permeability, alkali solubility, and methylene blue absorption. According to these tests, fabric 1, part poor-quality new wool, is superior to fabric 2, part reworked wool. Tests for fiber quality on new blankets rated the two fabrics in the same order. Fabric 3 differs significantly from fabric 1 in strip breaking strength, air permeability, cystine sulfur content, and alkali solubility. Fabric 2 differs from fabric 3 in the warp breaking strength by both strip and grab tests, in filling strength by the strip method, sulfur and methylene blue. Fabric 3 is deteriorated more than fabric 1 but less than fabric 2. Tests for fiber end damage and length of fibers on unlaundered blankets, however, show that fabric 3 is least damaged.

"The breaking strength determined by the strip method showed more significant differences between fabrics than by the grab method. Also there were more significant differences in the filling direction than in the warp. As shown by laboratory analyses, significant changes were produced in blankets by service, but increasing amounts of wear and laundering did not produce progressive changes in the various properties. In this study none of the blankets were worn out after 48 or 60 launderings representing 96 and 120 weeks of wear, respectively."

A study of four classes of sheets during service. M. B. HAYS and R. E. ROGERS. (U. S. D. A.). (*Jour. Home Econ.*, 34 (1942), No. 2, pp. 112-117, figs. 3).—"The serviceability of percale, fine-count, two brands of mediumweight muslin, and one construction of heavyweight muslin sheets was studied by determining weight per square yard, thickness, warp and filling count and breaking strength, and shrinkage in length and width of representative sheets from each lot tested when purchased and after various intervals of actual service. The sheets were put into service in a Washington hotel where they were used for about 2 yr., after which they were reissued to homemakers. The data obtained indicated that "as wear progressed, each lot of sheets deteriorated progressively. The amount of service given by these five groups of sheets is closely related to their filling breaking strength. The heavyweight sheets intermediate in price were in general heavier, stronger, and less chemically tendered than the other classes originally and during service. The percale and fine-count sheets which were most expensive of those studied did not last so long as the heavyweight muslin, but they had a finer, softer texture.

Although the percale cost more than the fine count, it wore no longer than the latter. In this study the mediumweight muslin sheets which were lowest in price gave the least service."

A study of oxygen absorption and catalase production during growth of *Chaetomium globosum* on cotton fiber and yarn, D. E. KLEMMER. (U. S. D. A.). (*Jour. Bact.* 43 (1942), No. 2, pp. 171-180, figs. 5).—Sea-island cotton fiber and yarn manufactured from it were sterilized and inoculated with a strain of *C. globosum*, isolated from mildewed canvas, and incubated for 28 days in a Warburg apparatus of the seven-manometer, refrigerated type. The modified Warburg technic developed for studying the growth of the micro-organism on cotton is described. The growth of the organism was followed by daily measurements of oxygen consumption and by determination of catalase production as measured by the amount of hydrogen peroxide decomposed. In general the rate of growth of the organism on the fiber and on the yarn increased during the first 11 days, as indicated by the increased daily rate of oxygen consumption, after which it decreased. The amount of oxygen absorbed by the fungus growing on the fiber was significantly greater than that absorbed by the fungus growing on the yarn. Likewise, the amount of catalase produced by the fungus on the fiber was greater than on the yarn. These results indicated that, in general, raw cotton would deteriorate more readily in a moist atmosphere than would yarn or fabric, and more care, therefore, should be taken in storing the fiber. The accumulated amount of oxygen absorbed by the organism was estimated by adding the amount absorbed each day to the amount absorbed on previous days. The total amount absorbed by the fungus growing on 1 gm. of the fiber for 28 days was 0.32 milliequivalent and on 1 gm. of yarn 0.21 m. e. By the method of least squares a fourth degree polynomial equation was found for the accumulated absorption values for the fiber and another for the yarn.

Clothing supplies of socially participating white farm families of Mississippi, A. BOWIE and D. DICKINS (*Mississippi Sta. Tech. Bul.* 30 (1942), pp. [2]+51, figs. 6).—This study presents an analysis of the clothing owned by members of socially participating white farm families in 6 poor and 6 better agricultural areas in the State. The socially participating family was considered as one in which all members attended daytime preaching at least once a quarter. Clothing inventories were obtained from such families in all of the 70 churches in the 12 areas involved. "Ratings based on the modes for sex and activity groups were set up and given each individual clothing inventory. Somewhat more of the wardrobes of individuals in the poorer than in the better agricultural areas were classed as minimum supplies, while somewhat more of the wardrobes of those in better areas were rated as average and above. That there was not a greater difference was because more members of the poorer area families had gifts of clothing, or made dress garments at home." The composition of the minimum wardrobes for social participation in either area is noted for various family members in terms of headwear, outer garments, and footwear. These minimum wardrobes, it is pointed out, do not represent the minimum desirable for social participation in these areas. The families whose clothing supplies were ranked as minimum were also the ones who made up the majority of the group with the lowest social participation. These clothing types appeared to lack warmth and social acceptability. Clothing supplies with the characteristics most common to the entire sex and activity group were from the standpoint of comfort and social adequacy the best for the least cost.

Minimum clothing supplies, D. DICKINS (*Miss. Farm Res.* [Mississippi]

Sta.], 5 (1942), No. 10, p. 2).—A list of the minimum clothing supplies discussed in the publication noted above.

Performance during wear of women's and children's wearing apparel fabrics (*Rhode Island Sta. Rpt.* [1941], pp. 51-52).—A progress report on a cooperative project of six of the northeastern stations.

British develop clothing standards as result of rationing program (*Indus. Standardization*, 13 (1942), No. 7, pp. 207-208).—It is noted that four British war emergency standards for women's clothing have been issued by the British Standards Institution "to provide good coupon value" for rationed garments. The four standards, covering women's dresses, underwear, blouses, and boots and shoes, specify methods of manufacture, including minimum allowance for seams, minimum number of stitches per inch and per button and type of seam to be used, in addition to the series of standard sizes qualified according to hip, bust, and waist measure. The standard provides that a size tag indicating the size specification to which the garment conforms must be attached to the garment. Charts for each series of sizes give more detailed measurements, including cross back, cross chest, armhole circumference, etc. The Board of Trade for which the BSI prepared the standards has authority to make these mandatory for the manufacture of all garments in the classifications covered. This has been done in the case of women's underwear and blouses.

A comparison of the efficiencies of home and commercial laundry processes, E. LOVELL, J. ROBERTS, and J. BRODIE (*Amer. Dyestuffs Rptr.*, 31 (1942), No. 13, pp. 301-306, 324, fig. 1).—Standard cotton test bundles consisting of (1) high-grade unsized tarantulle sheeting for the determination of tensile strength and fluidity, (2) a standardly soiled heavy weight drill and a standardly soiled tarantulle sheeting for the determination of detergency efficiency, and (3) a white cotton duck for the determination of whiteness retention were laundered by a controlled commercial process and by home processes involving various combinations of gyrator and vacuum-cup washing machines with wringer or spinner and with drying indoors or outdoors. The home supplies consisted of water containing 9 gr. of hardness per gallon, a pure soap flake, sodium carbonate to soften the water, and a bluing. The commercial process used permutite-softened water and a multiple suds formula approved by the American Institute of Laundering. Five series of 20 bundles each were washed by the domestic and the commercial processes. Five bundles from each series were removed after 10, 25, 50, and 100 washings for determinations of tensile strength and fluidity and of whiteness retention and soil removal.

"By a statistical analysis of the data it was found that in the washing of cotton for soil removal the commercial process is superior to all domestic processes. For tensile strength loss the commercial process compares favorably with the domestic processes in which samples were dried outdoors, but loss in strength is greater in the commercially washed samples than in those washed domestically and dried indoors. Chemical degradation is least when clothes are dried indoors as in the commercial method and in the domestic process using indoor drying. The gyrator and vacuum cup gave similar results for degradation and tensile strength loss. The detergency efficiency of the gyrator in most cases was slightly superior to the vacuum cup. The wringer aids materially in soil removal and is superior in this respect to the spinner extractor. From the standpoint of wear indoor drying is preferable to outdoor, but for whiteness retention outdoor drying is preferable."

The language of fashion: A dictionary and digest of fabric, sewing, and dress, M. B. PICKEN ET AL. (*New York and London: Funk & Wagnalls Co.*, [1939], pp. XV+175, figs. 580).—Definitions are given for about 8,000 words associated primarily with wearing apparel and accessories and whatever goes

into the making of them. The words are defined from the fashion point of view and are assembled in groups for comparison and quick reference. Important stitches, laces, embroideries, and weaves are described; fabrics and leather are defined and their suitability for garments and other articles specified; furs, real and imitation, are noted; and hundreds of types of garments are given, with important identifying silhouette features and often notes regarding origin. Fashion names and terms from past eras, as well as those in current usage, are given, and trade terms, important trade marks, and copyrighted names are included. For the most part only the preferred spelling and pronunciations are given, but alternates are noted occasionally.

Glass curtain fabrics studied (*Ohio Sta. Bul. 617 (1940), p. 61*).—A progress report for the year 1938–39.

HOME MANAGEMENT AND EQUIPMENT

Rural family living with supplemental farm incomes (*Rhode Island Sta. Rpt. [1941], p. 52*).—This progress report on a study of family living under a combined rural-urban situation (residence in the country and employment in the city) deals with food consumption habits as determined by records covering 2 weeks obtained from over 1,000 families.

MISCELLANEOUS

Twenty-first Annual Report [of the Georgia Coastal Plain Station], 1941, S. H. STARR (*Georgia Coastal Plain Sta. Bul. 32 (1941), pp. 139, figs. 12*).¹⁰

Progress of agricultural research in Ohio: Fifty-eighth Annual Report of [Ohio Station], 1939, E. SECREST (*Ohio Sta. Bul. 617 (1940), pp. 91, figs. 21*).¹⁰

Fifty-fourth Annual Report [of Rhode Island Station, 1941], B. E. GILBERT (*Rhode Island Sta. Rpt. [1941], pp. 62*).¹⁰

¹⁰ The experimental work reported is for the most part referred to elsewhere in this issue.

NOTES

Tuskegee Institute.—Dr. George Washington Carver, associated with the agricultural research work of the institute since 1896, died January 7. The following extracts from an editorial in *The [Washington] News* summarize his remarkable career:

"Dr. Carver was born about 79 years ago—he never knew the date—in a primitive Missouri cabin. He was a slave and the son of slaves. . . . A war gave him freedom of body, but he freed his own intellect, overcoming almost insuperable obstacles of poverty and prejudice to gain learning and understanding. He devoted his life to the education and advancement of his race and to creative science. His discoveries of new uses for familiar substances, especially for the products of southern agriculture, are a rich legacy to his country and the world."

Arkansas University and Station.—Dr. S. B. Locke, assistant professor of plant pathology, has resigned. Dr. M. A. Sprague and L. B. Schweiger, instructors in agronomy and bacteriology, respectively, have entered military service. E. D. Matthews has been appointed associate professor of agronomy.

California University and Station.—According to a note in *California Fruit News*, the campus of the School of Agriculture at Davis and most of the facilities were to be taken at the end of the semester by the Signal Corps, U. S. Army, for training purposes. Some of the instruction courses are being transferred to Berkeley and Los Angeles, but it is expected to maintain the research and experimental field facilities under the supervision of the College of Agriculture.

Colorado College and Station.—Research on wool baling has shown that wool can be baled with half the amount of war-short burlap required when wool is marketed in bags. Tough wrapping paper supplements the burlap in baling in a cotton press.

The sections of home economics and mechanical engineering have planned and built an experimental dehydrator, in which about 20 Colorado fruits and vegetables have been tested. In cooperation with the Western Regional Research Laboratory, the station also is investigating the suitability of various varieties of Colorado fruits and vegetables for quick freezing.

Dr. N. A. Christensen, dean of the division of engineering, has been granted leave of absence at the request of the War Department. Dr. H. H. Stonaker has been appointed assistant in animal investigations, and Eugene Bertone, wool technologist.

Connecticut [New Haven] Station.—Dr. John W. Heuberger, plant pathologist, has resigned to engage in commercial work. He will continue his research for the Crop Protection Institute on organic fungicides at the Subtropical Experiment Station at Homestead, Fla.

Purdue University and Indiana Station.—A 623-acre farm, located near Carmel, has been given to the university for the use of the station by Charles J. Lynn of Indianapolis, together with his herds of 170 breeding Shorthorn cattle, 60 Percheron horses, 540 Berkshire hogs, and 100 head of feeding cattle. The farm, which is fertile and well equipped, will be used primarily as a source of seed stock for breeding animals.

The station was recently awarded a grant by the Nutrition Foundation, Inc., to investigate problems concerned with the vitamin C content of tomatoes and to determine the influence of breeding and selection upon these characteristics in existing strains of tomatoes as well as in the new strains which have resulted from hybridization of commercial strains of the wild species *Lycopersicon*. The work will be under the direction of the botany and agricultural chemistry departments, and Dr. J. W. Porter and G. M. Kohler have been added to the staff to carry it on.

At the northern Indiana Muck Soils Experimental Farm, extensive investigations are being completed in cooperation with the U. S. D. A. Soil Conservation Service as a part of extensive studies on the influence of water levels in these soils upon such factors as crop production, fertility, and soil subsidence. L. B. Dumm has been given charge of the engineering phases of the project and Kent Ellis of the horticultural phases.

A cooperative project between the station and the U. S. D. A. Bureaus of Entomology and Plant Quarantine and Plant Industry has recently been initiated which will be concerned principally with the development of resistant strains of corn and the testing of existing strains for resistance to the corn borer. The project is coordinated with a program approved by the station directors of the north central region to investigate problems concerned with corn borer control. Six men have been transferred to Lafayette from the Bureau of Entomology and Plant Quarantine to work on this program, and the corn breeding has been similarly transferred by the Bureau of Plant Industry.

Dean Emeritus Martin L. Fisher died December 1, 1942, at the age of 71 years. A native of Indiana, he was graduated from Purdue in 1903 and received the M. S. degree from the University of Wisconsin in 1912. He joined the Purdue staff immediately on graduation and had served continuously until his retirement in 1942. Beginning as instructor in agriculture, he became professor and assistant dean of agriculture in 1920 and was made dean of men in 1926.

Leave of absence has been granted to Dr. R. E. Nichols, assistant professor and associate in veterinary science, to enter military service and to four assistant agronomists, A. P. Bell, Sutton Myers, G. H. Robinson, and P. T. Veale, to work on a guayule project in California. Resignations from the station include R. L. Witz as assistant in agricultural engineering and Dr. E. D. Walter, R. L. Henry, and D. L. Johnson as assistant chemists. J. B. Kohlmeier has been appointed associate in land-use planning; P. C. Brown, assistant in veterinary science; M. A. Ewan and D. R. Bowman, assistants in agricultural chemistry; and T. L. Canada, technical assistant in agricultural economics.

Kansas College and Station.—A 57-acre tract in the Kansas River Valley, 6 miles from the college campus and adjoining a soil conservation nursery, has been purchased under a State appropriation of \$15,000 for the department of horticulture. The new farm will be used for student instruction and research in vegetable crops and pomology.

Leave of absence to enter the armed forces has been granted to Don E. Crumbaker, assistant in charge of the bindweed experiment field; Wilbert Greer, superintendent of the college poultry farm; and H. D. Hollembek, assistant in cooperative experiments in agronomy. Dr. J. W. Faith, head of the department of chemical engineering, has resigned to accept a similar position in the University of Iowa.

Kentucky University and Station.—Leaves of absence have been granted for military service to Charles Bortner, assistant in agronomy; Dr. D. W. Bruner, associate bacteriologist in animal pathology; Donald W. MacLaury, assistant in animal industry; and J. R. Todd, analyst in agronomy. The resignations are noted of Dr. R. H. Allen, associate professor of farm economics; Florence P. Meier, technician in animal pathology; Merton D. Oyler, assistant professor and assist-

ant in farm economics; Dr. J. T. Spencer and Hugh G. Myers, assistants in agronomy; and Emmett Dozier, Jr., inspector in creamery license. Recent appointments include R. W. Pifer as assistant professor in animal industry, E. S. McConnell as instructor and assistant in animal industry, Dr. J. H. Hardison as assistant in agronomy, and W. C. Stammer as assistant chemist and spectroscopist in chemistry.

Montana College and Station.—Harold G. Halcrow, assistant professor of agricultural economics, and T. S. Aasheim, assigned to the agronomy department as research project leader of the U. S. D. A. Soil Conservation Service, have resigned to enter the armed forces. The latter has been succeeded by Ralph A. Cline of the field operations division of the Soil Conservation Service. Dr. Royse P. Murphy has been given leave of absence to become geneticist in the California guayule emergency rubber project.

Cornell University and Station.—Dr. Henry M. Munger, instructor and research investigator in the breeding of vegetable crops at the University of Wisconsin, has returned to Cornell as assistant research professor of plant breeding and vegetable crops and will carry on research on the improvement of vegetables by breeding and selection under a special appropriation recently provided by the State legislature.

North Dakota Station.—Dr. Bruno Vassel has been appointed assistant agricultural chemist.

Ohio Station.—Recent additions to the staff include H. R. Moore as associate in rural economics and sociology, Alfred Van Wagenen as associate in animal industry, and Lois Jones as assistant in dairy industry.

Oklahoma College and Station.—Dr. A. E. Darlow, chairman of the animal husbandry department at the Wisconsin University and Station, has returned to Oklahoma as head of the department of animal husbandry vice W. L. Blizzard, who continues as dean of agriculture. Horace S. Smith, agronomist in charge of the Oklahoma farm wheat improvement program, has been granted military leave.

Puerto Rico University Station.—Dr. Arthur H. Rosenfeld, special technologist for cane investigations from 1923 to 1926 and widely known as an authority on various phases of the sugar industry, died in Washington, D. C., on October 6, 1942, at the age of 56 years. A native of Virginia and a graduate of Virginia Polytechnic Institute, he had held numerous commercial positions and served as assistant in the State Crop Pest Commissions in Virginia and Louisiana, as State horticultural inspector in Illinois, as special field agent of the U. S. D. A. Bureau of Entomology and Plant Quarantine, and as entomologist and director of the Sugar Experiment Station of Tucumán, Argentina, and from 1932 to 1942 as sugarcane technologist for the Egyptian Ministry of Agriculture. At the time of his death he was under appointment with the Dominican Republic Settlement Association.

Rhode Island College and Station.—The resignations are noted of Quirino A. Trementoizzi, research assistant in chemistry, and William R. Gordon, rural sociologist, the former to engage in commercial work and the latter to accept a position with the extension service of the Pennsylvania College. John W. Stephenson has been appointed assistant agronomist; Harry L. Keil, assistant plant pathologist; Leonard P. Pepkowitz, assistant chemist; and Josephine Gardner, assistant home economist.

Utah College and Station.—D. C. Tingey, associate professor of agronomy, has been given leave of absence to accept a position with the U. S. D. A. Bureau of Plant Industry as senior agronomist in the guayule production project in California and other Southwestern States. Leroy Van Horn and Dr. Irvin F. Edwards have been appointed assistant professors of animal husbandry, the

former for sheep and wool work and the latter for meats and beef cattle teaching and investigations.

Vermont Station.—Collection of data on milk assembly has been completed for the State, and recommendations for changes in the interest of conservation of tires and trucks have been worked out. A copy of the recommendations for each plant has been sent to the plant manager or a representative of the producers, and maps of the assembly routes have been furnished where requested. The State representative of the Office of Defense Transportation has indicated his interest in this work, and it is believed that it will also be of substantial value in promoting understanding and acceptance of a central program by farmers and truckmen.

A tentative outline for a course on labor-saving methods in doing dairy barn chores has been prepared for use in the production courses which are given under the supervision of teachers of vocational agriculture. Additional material on causes of farm fires in Vermont has been furnished to the extension service and used by it in news releases urging fire prevention.

New Journals.—Two volumes per year are being issued of *Archives of Biochemistry*, published at 125 East Twenty-third Street, New York City. The initial number contains the following articles: Synthetic Peroxidases, by E. C. Gjessing and J. B. Sumner (pp. 1-8) (Cornell Univ.); A Method for Measurement of Yeast Growth in Bios and Vitamin Investigations, by L. Atkin, A. S. Schultz, and C. N. Frey (pp. 9-16); The Carotenoid Pigments of the Fruit of *Celastrus scandens* L., by A. L. LeRosen and L. Zechmeister (pp. 17-26); Heat Capacity and Bound Water in Starch Suspensions, by M. E. Freeman (pp. 27-39) (Mass. Expt. Sta.); The Metabolism of Crotonic Acid, by F. Lipmann and G. E. Perlmann (pp. 41-50); The Inverse Ratio Between Fluoride in Food and Drink and Dental Caries, by J. F. McClendon, W. C. Foster, and G. C. Supplee (pp. 51-57); Carbon Monoxide Inhibition of Nitrogen Fixation by *Azotobacter*, by C. J. Lind and P. W. Wilson (pp. 59-72) (Univ. Wis.); Environmental Temperatures and B-Vitamin Requirements, by C. A. Mills (pp. 73-81); Viscosimetric Studies on the Tobacco Mosaic Virus Protein, II, by V. L. Frampton (pp. 83-92) (Cornell Univ.); (E. S. R., 81, p. 662); Some Sulfanilamide Antagonists as Growth Factors for Lactic Acid Bacteria, by E. E. Snell and H. K. Mitchell (pp. 93-101); The Activation of Papain, by E. M. Scott and W. M. Sandstrom (pp. 103-109) (Minn. Sta.); Interference Between Bacterial Viruses—I, Interference Between Two Bacterial Viruses Acting Upon the Same Host, and the Mechanism of Virus Growth, by M. Delbrück and S. E. Luria (pp. 111-141); and Essential Steps in the Enzymatic Breakdown of Hexoses and Pentoses, by J. C. Wirth and F. F. Nord (pp. 143-153).

Boletín del Departamento de Sanidad Vegetal is being published semiannually by the Ministry of Agriculture at Santiago, Chile. The initial number contains much statistical and tabular data on the occurrence of plant and insect pests in Chile and several original articles, among them *La antracnosis de la vid* [Anthracnose of the Grape], by S. J. Tartakowsky H. and S. T. Arentsen S. (pp. 7-18); *Antracnosis de la vid en Chile* [Anthracnose of the Grape in Chile], by A. E. Jenkins and A. A. Bifancourt (U. S. D. A. et al.) (pp. 19-53); *La nosemosis, enfermedad de las abejas* [Nosemosis, a Disease of Bees] by L. Durán M. (pp. 54-60); and *Contribucion preliminar al estudio de la polilla del frejol* [The Pea Moth], by G. Brücher E. (pp. 63-69).

EXPERIMENT STATION RECORD

VOL. 88

APRIL 1943

No. 4

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The respiration and storage behavior of soybeans, P. E. RAMSTAD and W. F. GEDDES. (Coop. U. S. D. A. and 11 expt. stas.). (*Minnesota Sta. Tech. Bul.* 156 (1942), pp. 54, figs. 8).—This presents an historical review and a full account of a detailed experimental investigation of the effects of moisture content, temperature of storage, and micro-organisms upon the respiration, seed viability, and resistance to spoilage of whole beans, and the behavior of split beans and oil meals in storage, together with the production of carbon monoxide by heated beans. Among numerous conclusions recorded, the authors note the observation that an electrical resistance moisture meter which had been calibrated and used for official grading gave significantly low results, especially at higher moisture contents, as compared with a method involving drying under reduced pressure after air drying. The two-stage "vacuum" oven method (the oven being used at not over 25 mm. pressure) gave the figure 15.6 percent, for example, for a sample which showed only 14.3 percent by the moisture meter method. At this moisture content soybeans were observed to heat when stored at laboratory temperature (25°–26° C.). "Since the permissible moisture limits for grades Nos. 1, 2, 3, and 4 are 13, 14, 16, and 18 percent [meter figures], respectively, grades Nos. 3 and 4 involve a great storage risk except for relatively short periods at low temperatures." The electric method has subsequently been recalibrated.

High carbon dioxide production and loss of viability appeared to be due, in large measure, to micro-organismic activity. Both high carbon dioxide production and heavy loss of viability were found associated with spoilage by molds and souring.

Carbon monoxide was detected by qualitative tests in the gas drawn from heating soybeans both in the elevator bin and in the small adiabatic respirometer.

Butyl-acetonic fermentation of Jerusalem artichokes, R. T. WENDLAND, E. I. FULMER, and L. A. UNDERKOFER. (Iowa State Col.). (*Indus. and Engin. Chem.*, 33 (1941), No. 8, pp. 1078–1081, fig. 1).—The authors show that the levulans of the Jerusalem-artichoke are converted to levulose by milk acid hydrolysis. After the acid is neutralized the resulting hydrolyzate is a suitable raw material for fermentation by the butyl acetone organism, *Clostridium acetobutylicum*. To secure maximum yields of products from the fermentations, it is necessary to add additional nutrients, in the form of corn meal or soybean meal, to the Jerusalem-artichoke hydrolyzates. Hydrolyzates prepared from extracts of dried Jerusalem-artichoke chips ferment somewhat more satisfactorily than hydrolyzed aqueous pulps of the dried chips or the fresh tubers. The solvents formed by the butyl acetone organism from fermentations of Jerusalem-artichoke

extract hydrolyzates are identical with those from fermentations of corn mash and are produced in about the same ratio.

Effect of rate and extent of freezing on texture of asparagus, M. A. JOSLYN and S. B. KILNER. (Univ. Calif.). (*Quick Frozen Foods*, 4 (1942), No. 12, pp. 14-15, 35, figs. 3).—Texture before and after cooking and the loss of weight due to "drip" in a 16-hr. defrosting period were compared in 2½-lb. samples of asparagus subjected to slow freezing in air at -5° F. and to quick freezing at -25° for periods of 3, 6, and 14 hr. The samples were tested after storage at -5° for 6 days and for 6 mo. After each of these storage intervals the texture of the slowly frozen sample was markedly inferior to that of the quick-frozen samples, and the loss of weight due to drip amounted to about 32 percent in the former as compared with about 24 to 26 percent in the latter samples. The extent of quick freezing from 3 to 14 hr. had no effect on texture; if anything, the completely frozen sample (14 hr.) was less desirable in texture than were the partly frozen samples.

Methods of regulating the methoxyl content of pectins, G. L. BAKER. (Del. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 22 (1942), No. 1, pp. 10-12).—Most manufacturers are interested in producing as high a grade of pectin as possible, regardless of any other characteristic, such as a fast or slow set. These makers should regulate the methoxyl content of their pectins to approximately 8 percent. Some manufacturers now wish to produce pectin preparations which can be standardized to produce low-sugar or nonsugar jellies with calcium, however. Research up to the present indicates that the better products for this purpose contain between 4.5 and 5.5 percent methoxyl. In either instance the value of the regulation of methoxyl content in the commercial manufacture of pectin is unquestionable.

Demethylation of pectin without excessive lowering of grade requires a temperature below 60° C., a high acidity (low H-ion concentration), and a relatively long period of time. The concentration of pectin-containing material (pomace, albedo, or undiluted pectin) in the mixture during the demethylation reaction is of little importance. Great care and exactness must be exercised in controlling the variable factors affecting demethylation, as otherwise duplication of results is impossible. Extraction and demethylation in dilute solution has produced pectinic acids of the highest grade but is, in general, impractical for commercial use. A process of high-temperature extraction, concentration, and adjustment of methoxyl content after concentration is outlined and is considered commercially feasible. In the enzyme method of regulating the methoxyl content of pectinic acids, the pectase must be comparatively free of pectinase, the pectin degradation enzyme, otherwise jellying values are ruined. The ease and accuracy of controlling demethylation of pectinic acids with pectase gives this method, theoretically, a distinct superiority over the acid method, but the product thus far actually obtained has been found inferior in jelly grade and calcium tolerance. The calcium tolerance of the pectin, or the sensitivity to calcium, in the preparation of calcium pectinate gels has been low. Optimum concentrations of calcium for gelation are also found to lie in a very narrow range. The method is impractical for producing pectinic acids of 8 percent methoxyl content for ordinary 65 percent soluble-solids jelly purposes. The data obtained thus far favor the acid-demethylated products, because these products appear to be able to make satisfactory jellies in a much wider range of calcium content.

Whether a pectinic acid has had its methoxyl content regulated by acid or enzyme treatment and whether it has been precipitated by alcohol or metallic salt, at a similar methoxyl content, as the soluble solids in a jelly are reduced, the calcium requirement is increased, the optimum pH of gelation is increased

slightly, the time of set is increased, the temperature of set is decreased, the melting temperature is decreased, and the tendency for marked syneresis increases.

Promoting the oxidation of fats and oils: Relative effectiveness of different bands of the visible spectrum, G. R. GREENBANK and G. E. HOLM. (U. S. D. A.). (*Indus. and Engin. Chem.*, 33 (1941), No. 8, pp. 1058-1060, fig. 1).—The effectiveness of different bands of light of the visible spectrum in promoting the oxidation of corn oil, cottonseed oil, lard, and butter oil was determined by the use of light bands obtained with filters and a monochromator and adjusted to equal intensity in each measurement.

The results indicate that the effectiveness increases with a decrease in the wave lengths employed. The energy of the blue end of the spectrum was most effective in promoting oxidation. Light absorption data upon samples of oils of the types used indicate that the light energy absorbed in the yellow, orange, and red regions (5,400-7,500 a. u.) of the spectrum is practically constant for each oil and exceeds 5 percent only for lard. Irradiation with light in these regions produced relatively small amounts of peroxides. With light of wave lengths shorter than 5,400 a. u., the light absorption and the quantity of peroxides formed increased progressively with decrease in the wave length. The magnitude of these increases varied with the type of oil used.

The Lundegårdh apparatus: Its construction and use, J. A. C. McCLELLAND and H. K. WHALLEY (*Jour. Soc. Chem. Indus., Trans.*, 60 (1941), No. 11, pp. 288-291, figs. 2).—"An account of the Lundegårdh apparatus for the examination of flame emission spectra is given. Details of the construction are included which would enable other laboratories to build a similar apparatus, for which there appears to be a demand; also of the interpretation of the spectrograms obtained and application of the flame technic which will give some indication of the type of problems that such an apparatus would solve in a spectrographic laboratory."

Colorimetric microdetermination of iron, C. P. SIDERIS. (Univ. Hawaii). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 9, pp. 756-758, fig. 1).—"Ferrous iron forms with nitroso R salt (1-nitroso-2-hydroxy-3,6-naphthalene disodium sulfonate) at favorable range of pH values (8 to 10) a green pigment which is in direct proportion to the amounts of ferrous iron present in the solution. The sensitivity of the reagent is very great, reaching the low limits of 0.2 μ g. of ferrous iron per cubic centimeter and ranging between 0.2 and 50 μ g. or more. Hydroxylamine sulfate was found highly satisfactory for the reduction of ferric to ferrous iron and sodium acetate or ammonium hydroxide for obtaining a satisfactory pH range for the development of the green pigment. Iron may be determined by means of a photoelectric colorimeter with the use of appropriate light filters."

Modified methods for the chemical and biological determination of choline, R. W. ENGEL. (Ala. Expt. Sta.). (*Jour. Biol. Chem.*, 144 (1942), No. 3, pp. 701-710).—"The chemical method, described in detail, involved prolonged and repeated extraction of the sample of biological material (containing from 4 to 8 mg. of choline) with 30-cc. portions of absolute methanol; evaporation of the combined extracts to near dryness under reduced pressure; hydrolysis of the residue with saturated barium hydroxide solution at 100° [C.] for 2 hr. followed by neutralization and filtration; precipitation of the choline from the hydrolyzate as the reineckate; solution of the precipitate (washed with small portions of cold ethanol) in acetone; and determination of the concentration of choline reineckate by means of a photoelectric colorimeter, the *L* value being referred to a standard curve obtained from readings on 12 solutions containing

varying concentrations of pure choline chloride. The biological assay consisted in comparing the amount of protection afforded by pure choline chloride (4 mg. daily) and by the food material (at levels supplying 4 mg., more than this, and less than this, daily) in prevention of kidney hemorrhages in weanling litter-mate rats on the choline-deficient diet previously developed (E. S. R., 86, p. 420). The chemical method gave reproducible results and satisfactory recoveries and was specific in that other possible reineckates failed to precipitate under the conditions of the test.

Results by this method were determined for different strains of yeast, liver from different mammalian species, peanut meal, soybean meal, and mature soybeans. In general the values for yeast and livers were from 30 to 50 percent higher than those reported by other workers. The bio-assay procedure gave quite uniform results when comparisons were restricted to rats within a litter and was highly sensitive, since variations of 10 percent in the test food material could be detected. The bio-assay apparently determined total choline value, since the protection afforded by certain materials (dried beef liver, for example) was greater than could be accounted for on the basis of the choline content as determined chemically.

Determination of choline: A photometric modification of Beattie's method, M. H. THORNTON and F. K. BROOME. (Ind. Expt. Sta. coop. U. S. D. A. et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, pp. 39-41, fig. 1).—Choline is precipitated as the reineckate, and the transmittancy of the red-colored acetone solution of this precipitate is measured by means of a photoelectric photometer. The value $(\log I_0/I) \div L$, which is the negative log of the transmittancy of the solution divided by the length of the cell in centimeters, is read against the standard curve established with choline reineckate solutions prepared from varying amounts of a known solution of pure choline chloride. Quantities of choline varying from 0.6 to 16.0 mg. in a concentration range from 0.3 to 6.5 mg. per cubic centimeter can be estimated with a maximum error of 2 per cent.

Determination of beta-carotene and neo-beta-carotene with the visual spectrophotometer, F. P. ZSCHEILE and B. W. BEADLE. (Ind. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 8, pp. 633-634).—The authors who successfully applied a photoelectric spectrophotometric method to the carotene analysis of certain vegetables, employed a double monochromator with the radiation from an incandescent source of continuous radiation. Since this type of optical equipment is not generally available, a study was made of the adaptation of this method to simpler and less expensive instruments. It was found that β -carotene and neo- β -carotene could be determined in properly purified solutions from spinach extracts by means of a visual spectrophotometer, preferably with a type A-H4 mercury lamp. A photoelectric filter photometer did not isolate sufficiently narrow spectral regions for accurate analysis of the carotenoid mixture. The total carotene was calculated from the absorption at 4,358 a. u. and the percentage of either carotene from the absorptions at 4,358 and 4,916 a. u.

Studies on the carotenoids.—II, The isomerization of β -carotene and its relation to carotene analysis, B. W. BEADLE and F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 21-33, fig. 1).—Extracts of carotene prepared from fresh plant material differed spectroscopically from fresh solutions of pure β -carotene, the differences consisting of relatively decreased absorption toward the red and a slight shift of maxima toward the blue. When pure β -carotene was heated by refluxing in hexane, its absorption curve became similar to that of the plant carotene fractions. The same type

of spectrum was observed in a study of the mother liquor from recrystallized pure β -carotene. Solutions of these three types could not be chromatographically resolved on a column composed of equal parts of magnesium oxide and Hyflo super-cel, but were resolved into two zones on an alumina column. The β -carotene fraction eluted from this type of column possessed an absorption spectrum like that of the reference standard, while the pigment eluted from the brownish-yellow zone immediately below the β carotene gave maxima that were close to those of α -carotene as far as wavelength was concerned, but not in relative intensities. This second component, designated as neo- β -carotene, is an isomer of β -carotene. The quantitative absorption spectrum of neo- β -carotene was obtained and employed as a reference in carotene analysis. The conversion of β -carotene to neo- β -carotene was found to be reversible. Thus the conversion of β -carotene in hexane at 30° C. in the dark progressed gradually, as much as 25.1 percent of neo- β -carotene being formed in a period of 101 hr. Similarly, there was a reversion of neo- β -carotene to β -carotene in hexane in the dark at 40°, as much as 32.3 percent of β -carotene being present in the solution after 72 hr. Carotene fractions of a number of vegetables were found to contain from 79 to 90 percent of β -carotene, the rest being essentially the neo- β -carotene. Blanching of spinach for 30 sec. did not alter either the total carotene content or the percentage of β -carotene. Cooking in boiling water did not alter the total carotene, but decreased the percentage of β carotene from 86 to 81 percent. The loss of carotene and the amount of isomerization during the routine analysis were found to be small.

Studies on the carotenoids.—III, Distribution of pure pigments between immiscible solvents, J. W. WHITE, JR., and F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Jour. Amer. Chem. Soc.*, 64 (1942), No. 6, pp. 1440-1443, fig. 1).—The results of a quantitative study of the distribution of β -carotene, cryptoxanthol, and zeaxanthol between solvent pairs are presented for three different pairs of solvents, namely, hexane and aqueous solutions of methanol, diacetone alcohol, or 2-methyl-2,4-pentanediol. Curves were obtained showing the effect of water content of the alcohol solvent upon the partition ratios (ratio of concentration in epiphase to concentration in hypophase) of the three carotenoids for each of the three solvent pairs. From these curves values were selected for the optimum water content of the hypophasic solvent for separation of the several pigments. In the absence of cryptoxanthol it appeared that the partition of carotene-zeaxanthol mixtures between hexane and diacetone alcohol solutions (94.5-77.0 percent diacetone alcohol by volume) should be satisfactory for the separation of these two classes of pigment. In the presence of cryptoxanthol, extraction by 78.5 percent diacetone alcohol gave satisfactory separation of the carotene plus cryptoxanthol from the dihydroxycarotenes. Extraction of a hexane solution by a 92.0-percent solution of 2-methyl-2,4-pentanediol in water gave fair separation of cryptoxanthol from carotene, as shown by analysis of corn grain pigments.

[Studies on the carotenoids.—IV], The carotenoids of yellow corn grain, J. W. WHITE, JR., F. P. ZSCHEILE, and A. M. BRUNSON. (Ind. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Chem. Soc.*, 64 (1942), No. 11, pp. 2603-2606, figs. 4).—The carotenoids of corn grain were investigated by methods involving chromatography, partitionment between selective solvents, such as those noted above, and spectrophotometric examination of the pigments with a sensitive photoelectric spectrophotometer. Luteol, γ -carotene, and a compound tentatively identified as a hydroxy- α -carotene were found for the first time in yellow corn. A compound having some properties like those of the K carotene of Fraps and Kemmerer (E. S. R., 87, p. 8) was also separated. Preliminary quantitative

absorption spectra of neocryptoxanthol and two neozeaxanthol isomers are presented.

Studies on the carotenoids.—[V], Spectrophotometric determination of the carotenoids of yellow corn grain, J. W. WHITE, JR., A. M. BRUNSON, and F. P. ZSCHEILE. (Ind. Expt. Sta. and U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 10, pp. 798–801, fig. 1).—The pigments were extracted from ground corn (mature or immature) with acetone, from which they were extracted with ether. The nonsaponifiable portion of the ether extract taken up in acetone was treated with the solvents, as noted above, for separation of the pigments into three groups—carotene, cryptoxanthol, and carotenol. Pigment concentration was estimated spectrophotometrically. "The analysis of the carotene and cryptoxanthol fractions of corn-grain carotenoids in terms of normal and neotype pigments was not highly successful, but it is probable that analyses of the fractions for total pigment content are reliable at 4,325 a. u. for the carotene fraction and at 4,375 a. u. for the cryptoxanthol fraction. Analysis of the carotenol fraction for luteol, zeaxanthol, and total neocarotenols was made by spectrophotometric methods. Analysis for total pigment in this fraction was made at 4,275 a. u. Four inbred corn lines were studied. Variations in content of mature grain were as follows: Total carotenols twofold, total carotenes fourfold, total cryptoxanthols sixfold, luteol fourfold, and zeaxanthol twenty-fivefold."

Activation of dicalcium phosphate for the chromatographic determination of carotene, L. A. MOORE. (Mich and Md. Expt. Stas.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 9, pp. 707–708).—Certain lots of dicalcium phosphate, previously proposed as an adsorbent for the chromatographic removal of noncarotene pigments in the determination of carotene from plant materials (E. S. R., 86, p. 586), were encountered which were not good adsorbents. A study was made, therefore, of the effect of various procedures in activating these inactive lots. Boiling an inactive dicalcium phosphate with disodium phosphate, trisodium phosphate, or potassium hydroxide increased the activity of the adsorbent, as judged by the quantity of chlorophyll adsorbed from a petroleum ether extract or dehydrated alfalfa leaf meal. Of these, potassium hydroxide was the most effective, indicating that alkalinity was the primary factor for the activation process. The filtration rate was decreased by the activation procedure, although certain grades, particularly Merck's reagent with a coarse granular crystalline structure, could be highly activated and yet retain a fairly rapid rate of filtration. Where a filter aid was needed to speed up the filtration process, Dyno, a commercial dextrose, was found effective. Neither the length of time of boiling nor the quantity of water used, in amounts from 500 to 1,500 cc., had appreciable effect on the activation process. The procedure finally adopted involved the addition of 5 gm. of KOH in 1 l. of water to a weighed quantity (less than 100 gm., since more usually caused bumping), of the inactive dicalcium phosphate in a 2-l. Erlenmeyer flask. After boiling for from 15 to 30 min., the contents of the flask were transferred to a Büchner funnel, washed with from 0.5 to 1 l. of water, then placed in an evaporating dish and dried for 24 hr. at 100° C., and finally broken in a mortar ready for use.

Vitamin B₁ (ancurine) assay in white flour, J. R. NICHOLLS, R. G. BOOTH, D. W. KENT-JONES, A. J. AMOS, and H. H. WARD (*Analyst*, 67 (1942), No. 790, pp. 15–17).—This report outlines the methods at present employed by the four control laboratories that from time to time check the thiamin content of white flour enriched according to the British plan with 0.2 gm. of thiamin per 280 lb. of flour. The procedure outlined in detail involves extraction of the thiamin, without the necessity of enzymic digestion, by the use of dilute HCl, and oxida-

tion of the extracted vitamin by potassium ferricyanide added after treatment of the extract with methyl alcohol and 30 percent NaOH. The thiochrome formed is extracted with isobutanol, and the intensity of fluorescence of the solution is measured either photoelectrically, using the Spekker fluorimeter, or visually against a standard thiochrome solution. The method of calculation is given, and a few general points applying to the methods are noted.

The nature of the interfering chromogens encountered in the determination of nicotinic acid in cereal products, E. B. BROWN, J. M. THOMAS, and A. F. BINA (*Cereal Chem.*, 19 (1942), No. 4, pp. 447-457).—In order to establish the cause of the wide differences obtained by different chemical procedures of analysis of nicotinic acid, experiments were planned to include determination of the nicotinic acid content of the same materials by different procedures. The results showed that the differences obtained were due mainly to the method of hydrolysis used in the preparation of the extracts. Extracts of cereal products or milk prepared by strong acid or alkaline hydrolysis contained interfering chromogens. These were not present, however, in similar extracts of yeasts. These chromogens were not removed by the decolorizing techniques employed by the different procedures for treatment of the extracts, with the exception of the hydrogen peroxide treatment. The use of hydrogen peroxide was not so desirable, however, because of the difficulty in removing the excess peroxide. The chromogen, colorless in solution prior to treatment with cyanogen bromide and the aromatic amine, produced a dark brown color when metol was used as the amine and a lemon-yellow color with aniline. The color complex produced by the action of the chromogen with *p*-aminoacetophenone and cyanogen bromide was not soluble in ethyl acetate and hence was not extracted by this solvent in the procedure employing it to extract the color produced by these reagents with nicotinic acid. The use of *p*-aminoacetophenone and ethyl acetate gave consistent results with cereals (and milk and yeast) subjected to hydrolysis with strong acid or alkali, and the values obtained were in accord with the low antipellagric properties found by animal experimentation. The alternative method for obtaining such results with cereal products involved extraction by autoclaving a water suspension and subsequently treating with takadiastase. Mild acid hydrolysis was sufficient to convert completely any amide present in such extracts to the acid without the production of interfering chromogens and with a minimum of color in the extract.

Riboflavin estimation in fruits and vegetables, G. MACKINNEY and J. M. SUGIHARA. (Univ. Calif.). (*Jour. Amer. Chem. Soc.*, 64 (1942), No. 8, pp. 1980-1981).—The method of Conner and Straub (*E. S. R.*, 87, p. 10) was used in extracting and preparing the sample, except that, in the case of fruits, pectinol was used in addition to the clarase, the pectinol being absolutely necessary in the case of prunes, apricots, dates, etc., to produce a satisfactory solution. Because of the unavailability of Supersorb, adsorption and the following step, elution with pyridine-acetic acid, were omitted, and the determination was continued instead on the aqueous buffered solution, which was treated with KMnO_4 for destruction of interfering substances, decolorized with H_2O_2 , and after filtering compared with buffered standards at pH 6.0 in a Coleman fluorophotometer. The B_2 filter for the exciting light (mercury arc) cut out completely above 4,900 a. u. and for the fluorescent light below 5,100 a. u., thus eliminating any effect due to quinine sulfate and thiochrome. In the plant extracts tested there appeared to be no other interfering water-soluble compounds. Results obtained with a number of fruits and vegetables (asparagus, broccoli, peas, spinach, rice bran, apricots, prunes, dates, and grass, including some fresh and some dehydrated samples) showed values which, with two exceptions (peas and grass after dehydration), were slightly higher

than those obtained for the same samples by the adsorption procedure of Conner and Straub. The same samples measured after 20 hr. in the laboratory away from direct light showed the higher light stability of the aqueous extract. It is considered, therefore, that the simpler procedure is worth consideration where the adsorbent is unavailable, since comparative variations are reflected with accuracy in the figures; where absolute values must be considered, however, it is necessary to be more cautious.

Some factors that affect the microbiological method for riboflavin, M. I. WEGNER, A. R. KEMMERER, and G. S. FRAPS. (Tex. Expt. Sta.). (Jour. Biol. Chem., 144 (1942), No. 3, pp. 731-735).—Extracts of whole-wheat flour, of rice, and of bran were prepared by autoclaving these materials with 0.1 N HCl for 15 min. at 15 lb. pressure. The whole-wheat flour extract, made alkaline and subjected to photolysis to destroy riboflavin, stimulated acid production by *Lactobacillus casei* in the microbiological method for riboflavin. The addition of such an extract to the basal medium did not, however, remedy the difficulties experienced in obtaining the true riboflavin values of cereal products. The concentrated extracts of rice bran, wheat bran, or whole-wheat flour passed through florisil to remove the riboflavin and then added to tubes containing riboflavin stimulated acid production by *L. casei* well above the present maximum, thus indicating the presence in the brans and the flour of some stimulating substance other than riboflavin and different from the substance produced by alkaline photolysis. The addition of these extracts to the basal medium was not feasible, owing to the inability to standardize the response when the extracts were present in the medium and to obtain a usable curve. Treatment of the whole-wheat flour extracts with takadistase and papain did not destroy the stimulating factors.

Determination of thiamine in vegetables, J. C. MOYER and D. K. TRESSLER. (N. Y. State Expt. Sta.). (Indus. and Engin. Chem., Analyt. Ed., 14 (1942), No. 10, pp. 788-790, fig. 1).—The vegetables used included peas, broccoli, cauliflower, and spinach, freshly harvested and held in freezing storage after blanching and freezing in a Birdseye multiplate froster; and commercially frozen asparagus, cut corn, string beans, and lima beans. Thiamin was determined by (1) bio-assay procedure, using the growth technic and the basal diet of Chase and Sherman (E. S. R., 66, p. 410); (2) a thiochrome chemical procedure simpler than that of Conner and Straub (E. S. R., 87, p. 9) and involving acid and then enzymic digestion of the sample, base exchange purification of the extract, and production of the thiochrome; and (3) the fermentation procedure of Schultz et al. (E. S. R., 85, p. 727) involving the sulfite cleavage modification. In general, the results of the procedure of fermentation after sulfite cleavage were in good agreement with the thiochrome values. These thiochrome values in the case of lima beans (0.89 $\mu\text{g. per gram}$), cauliflower (0.43), and broccoli (0.88) were somewhat lower than the values obtained by bio-assay, these latter agreeing better with the fermentation values before sulfite cleavage. Bio-assay values for peas were appreciably higher than the thiochrome (2.60) or fermentation values. It is suggested that the basal diet of the animals might have been deficient in some known or unknown members of the B complex and that this deficiency was supplied by lima beans, cauliflower, broccoli, or peas, thus accounting for the higher response. Thiochrome values for asparagus (2.04 $\mu\text{g. per gram}$), corn (1.17), snap beans (0.64), and spinach (0.55) were somewhat lower than the bio-assay values except for spinach, in which case these two values were similar.

A possible vitamin D assay technique with radioactive strontium, L. H. WEISSBERGER and P. L. HARRIS (Jour. Biol. Chem., 144 (1942), No. 1, pp. 287-288,

fig. 1).—Radiostrontium, which has been shown to follow the same course in the body as radiocalcium, was chosen for use rather than radiocalcium, which is hard to prepare, or radiophosphorus, which exerts an action similar to that of vitamin D. Radioactive strontium was administered by stomach tube to rachitic rats, to normal litter-mate controls, and to rachitic rats fed vitamin D. The amount of radioelement retained was determined indirectly by determining the amount excreted, through radioactivity measurements on the excreta (urine and feces). In normal animals the amount of radiostrontium excreted over a 5-day experimental period amounted to from 40 to 60 percent of the dose administered, while in rachitic negative controls nearly 100 percent was excreted. Rachitic rats receiving one dose of 1.3 units of vitamin D₂ given 3, 2, or 1 day prior to or at the same time as the strontium excreted 30, 39, 52, and 56 percent of the ingested strontium. The vitamin D apparently acted rapidly in promoting retention of the strontium (calcium), since the amount of strontium excreted was roughly proportional to the length of time elapsing between vitamin and isotope administration. In another series animals receiving graded doses of vitamin D₂ (0.25–8.0 U. S. P. units) 48 hr. before radiostrontium administration excreted between 57 and 24 percent of the dose. These observed relationships suggest the possibility of using the procedure for vitamin D assay.

The commercial dehydration of food in wartime (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 12, pp. 372–374).—This is a brief general discussion of dehydration, its possibilities, limitations, and requirements, including some illustrative examples of fruit and vegetable processing.

Swift puts meat dehydration on a production basis, E. S. STATLER (*Food Indus.*, 14 (1942), No. 10, pp. 47–49, figs. 6).—The method, developed as the result of months of experimental work and expanded from the experimental pilot-plant stage to industrial proportions, is described in some detail as to operations, equipment, and lay-out of the production line. The process is one of continuous operation and involves precooking of the coarsely cut beef with barely enough water to prevent sticking and with constant agitation under steam pressure of from 3 to 10 lb. and a temperature not lower than 165° F. nor higher than 175° for 30 min. After this process, which inactivates the enzymes, coagulates the meat juices, reduces total water, and permits the beef to absorb the water, the batch is transferred by conveyor to a fine grinder, and the finely ground beef is fed directly into the rotating drum of a horizontal drier where air heated to about 300° is forced at a velocity of about 800 ft. per minute through the bed of meat. To speed up the removal of water vapor and to aid in keeping the meat in a fine state of division, the heated air is directed through the tumbling meat mass by louverlike vents as it moves lengthwise of the rotating drum to the discharge end. By the time the meat reaches the discharge end of the drum and after 2 hr. of drying, the moisture content is reduced to below 10 percent. The dehydrated meat is forced under a pressure of about 2,000 lb. per square inch into airtight containers and sealed under a 22-in. vacuum for export shipment. The compressed dehydrated beef requires only about one-tenth of the shipping space needed by its equivalent in the carcass state and one-third that required in the fresh boneless state. A further saving in space results in that refrigeration in shipping and storage is not required.

The product contains about 55 percent protein, 30 percent fat, 10 percent moisture, and may have added not more than 3½ percent salt. The mineral content of the meat is entirely retained, and the proteins are considered to be affected no more than in household cooking. Relatively short exposure to atmospheric oxygen and light keeps fat deterioration low, and samples are reported to have remained wholesome over the test period of 5 mo. It is noted that some

production and packaging difficulties are yet to be worked out in the dehydration of pork, which presents a greater problem than beef in the matter of fat stabilization, and for the accomplishment of this a tentative two-step process is outlined.

Develops dehydrating method for small meat plants, E. S. STALLER (*Food Indus.*, 14 (1942), No. 11, pp. 52-53, fig. 1).—A method developed by E. L. Griffith and S. L. Komarik and still in the experimental stage is described for use in the production of dehydrated pork, beef, veal, lamb, or mutton. The process involves salting, curing, and precooking of the meat. This step is carried out in numerous small plants that transfer the meat thus processed to a central dehydration plant where it is further processed and packaged for export.

Method developed for grading a dehydrated food, R. V. WILSON and H. M. SLOSBERG (*Food Indus.*, 14 (1942), No. 9, pp. 56-58, figs. 6).—The procedure adopted after testing various methods of preparing and cooking samples of dried eggs involved the addition of 12 gm. of whole egg powder to 50 cc. of distilled water in a 2 by 4½-in. wide-mouth bottle, followed by from 10 to 15 min. of shaking in a mechanical shaker. When numerous samples were prepared at one time they could be held at room temperature for several hours or in a refrigerator at 40° F. for 24 hr. without effect on the final score, providing the reconstituted sample was shaken by hand for a few minutes just prior to cooking. The reconstituted eggs were cooked (without the addition of fat or salt), above water kept gently boiling in an aluminum household egg poacher of the type having four small square trays supported above the water level. The cooked eggs were scored for flavor according to a numerical score system beginning with 10 and descending to 1 as flavor decreased in the following stages: Excellent, very good, good, slight storage flavor, storage flavor (these 5 suitable for household use), slight off-flavor, definite off-flavor, old and unpleasant flavor (these latter not acceptable for household use), very old and unpleasant flavor, and inedible. By this system judges were able to check their own results, and the scores of various judges usually showed close agreement.

Thoughts on the dehydration of fruits and vegetables, W. V. CRUESS. (Univ. Calif.). (*Canner*, 95 (1942), No. 16, pp. 12-13).—This paper emphasizes the necessity of blanching vegetables preliminary to dehydration and of properly packaging the finished product to prevent absorption of moisture.

Dehydration methods used in California, E. M. MRAK. (Univ. Calif.). (*Food Indus.*, 14 (1942), No. 8, pp. 50-52, figs. 3).—This paper is concerned with dehydrators originally designed to handle prunes, raisins, apples, and other fruits in commercial practice on the west coast, and with their suitability for dehydrating vegetables. How these dehydrators are designed and operated (methods of heating, temperatures used, and air flow) is discussed, and a few observations concerning proper storage are presented.

Notes on the dehydration of vegetables—past and present, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 12, pp. 368-370, fig. 1).—The author outlines the history of the process and points out some past experiences which should be taken into consideration in the present use of the dehydration process in the preparation of foods for military purposes.

Simple tests reveal improper blanching, B. E. PROCTOR (*Food Indus.*, 14 (1942), No. 11, pp. 51-52, fig. 1).—The importance of checking the adequacy of the blanching process in the dehydration of vegetables is stressed, and the readily applicable catalase and peroxidase tests as applied to dehydrated vegetables in the control of this step are described.

Composition and utilization of the beach plum, S. G. DAVIS and A. S. LEVINE. (Mass. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 12, pp. 361-364).—Products made from the fruit of the beach plum

(*Prunus maritima*) have long been on the market and favorably received in the Cape Cod region of Massachusetts, and the manufacture of beach plum products has become an expanding industry. The pleasing, characteristic flavor of these products is developing a broad reputation, and to meet the increased demand, several commercial manufacturers have established facilities for handling the fruit in large quantities. In 1941 the estimated crop of beach plums in Massachusetts was approximately 15,000 bu.

In the investigation here reported upon, determinations of the composition of the beach plum were made, together with some studies of its vitamin content. Information concerning the preparation and standardization of various fruit products from the beach plum is offered.

Dill pickles with more "eye appeal." (Coop. U. S. D. A.). (*North Carolina Sta. Rpt. 1941, p. 48, fig. 1*).—Packing of dill pickles in a clarified brine in glass containers to improve their appearance is noted.

Debitting of apricot kernels, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 21 (1942), No. 12, p. 365*).—The bitterness (due to amygdalin) could be removed by a few minutes' heating in water at 140° F., removing the skins, and further heating with water. Temperatures below 140° caused discoloration before completing the removal of the bitter flavor. At 140° the reaction was rapid and the product of light color. Higher temperatures seemed undesirable. Lye treatments (0.5-1.5 percent sodium hydroxide) and treatment with dilute sodium silicate solutions were also successfully used, the silicate being more rapidly leached out after the treatment than was the hydroxide.

Causes of darkening of packaged orange juice, E. L. MOORE, W. B. ESSFLEN, JR., and C. R. FELLERS. (Mass. State Col.). (*Canner, 95 (1942), No. 16, p. 13*).—The deterioration of packaged orange juice was found to be markedly influenced by heat, especially in the presence of oxygen; light had an additive effect too small to be of significance under commercial conditions. The decomposition of the ascorbic acid in the juice was directly associated with the darkening. It is suggested, therefore, that the best means of controlling darkening in orange juice is to utilize packaging methods and storage conditions which best prevent the oxidation of ascorbic acid.

Production of a bland sirup from apples, M. A. BRADSHAW and H. H. MORTERN. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus., 21 (1942), No. 12, pp. 356-358, fig. 1*).—The process described consists essentially in the sorting, washing, grinding, and pressing of the apples, the liming of the juice to pH 8, followed by heating to 175° F. and filtering, acidifying to a pH value between 5.0 and 5.5, an optional activated carbon and filtration treatment, and finally evaporation under diminished pressure to 75° Brix.

At a concentration of 75 percent solids the sirup was found to have an average content of levulose 40 percent, dextrose 13, sucrose 14, and nonsugar solids 8 percent. It is bland, without distinctive flavor of any sort, and is very sweet. It is of a light amber color. As a sweetening agent, this apple sirup will be superior to corn and sorghum sirups, about equal to maple sirup, and somewhat less effective than invert sirup and honey.

Homemade sorghum sirup, I. J. DUNCAN and E. J. WELHAUSEN (*West Virginia Sta. Cir. WS 5 (1942), pp. [8], fig. 1*).—This circular points out that a good crop of sorghum should yield about 100 gal. of sirup per acre and that the average family could use about 50 gal. per year. The circular very briefly discusses the handling of two varieties and takes up the processing, pressing, settling, and evaporating of the sirup, construction of the evaporating pans,

determination of the end point of the concentration by the end point of the sirup, the need for a suitable furnace, etc.

Bulk fermentation process for sparkling cider, D. K. TRESSLER, R. F. CELMER, and E. A. BEAVENS. (N. Y. State Expt. Sta. and U. S. D. A.). (*Indus. and Engin. Chem.*, 33 (1941), No. 8, pp. 1027-1031, figs. 8).—Semicommercial scale experiments on the production of sparkling cider by the secondary fermentation of cider in glass-lined pressure tanks indicated that the speed of carbon dioxide formation can be accelerated greatly by the addition of either apple juice or a concentrate prepared therefrom and a small amount of ammonium monohydrogen phosphate to the cider. Fermentations proceed more rapidly at 70° F. than at either a slightly higher or a slightly lower temperature. The choice of the strain of wine yeast is of great importance in determining the rapidity of carbon dioxide production. If the yeast food and supplements suggested are added to cider inoculated with a rapidly fermenting starter of the proper strain of champagne yeast, secondary fermentation occurs rapidly, 90 lb. per square inch carbon dioxide pressure developing in 3-4 days. Chilling and bottling require another 24-36 hr. Thus, the entire process of converting cider to sparkling cider requires only about 5 days. The flavor of the product is improved by the addition of tannin to the cider before fermentation and of a small amount of invert sugar and apple brandy at the time of bottling.

Effect of storage on sulfur dioxide in wine, D. R. MILLS and E. H. WIEGAND. (Oreg. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 22 (1942), No. 1, pp. 5-9, figs. 2).—A direct iodine titration was found to determine sulfur dioxide comparatively accurately in all types of wine. The differences in alcoholic concentrations encountered in wine had no influence on sulfur dioxide loss during storage in full sealed containers. The relationship between free and combined sulfur dioxide during storage of wine was found to vary both with type and with different samples of the same type. The quantity of sulfur dioxide that may be lost during the storage of wine was affected by the original concentration of the reagent in the wine. The percentage of loss of sulfur dioxide during storage varied inversely with the sugar concentration in wine.

The curing of vanilla, A. K. BALIS and F. E. ARANA. (U. S. D. A. and P. R. Expt. Sta.). (*Indus. and Engin. Chem.*, 33 (1941), No. 8, pp. 1073-1075, fig. 1; *Span. trans., Rev. Agr., Indus. y Com., Puerto Rico*, 34 (1942), No. 2, pp. 167-172).—The authors find that the traditional methods of curing vanilla beans to produce the required aroma cause a noticeable increase in the proportion of carbon dioxide formed in the tissues. Chilling the beans has the reverse effect. Oxidation does not always generate carbon dioxide in the curing process, however, and oxidation may be brought about by enzymes of the peroxidase type. Vanilla beans contain much peroxidase, and a complicated peroxidase system (phenols, peroxide, and enzyme) is present even after the completion of the curing process.

It is suggested that vanillin may be an intermediate product in the development of the desired aroma, and that products resulting from its oxidation may contribute to the final odor and flavor.

El uso de la sal en la destilación de hojas de malagueta: Datos utiles para ayudar a los destiladores a elaborar un producto mas uniforme y estimular su interés en la producción de otros aceites esenciales [The use of salt in the distillation of oil of bay: Data useful to the distillers in elaborating a more uniform product and to encourage their interest in the production of other essential oils], N. G. ARRILLAGA and M. A. JONES. (P. R. Expt. Sta.). (*Rev. Agr., Indus. y Com., Puerto Rico*, 34 (1942), No. 2, pp. 129-137, figs. 6).—It was found that the addition of sodium chloride and other

salts to the water in the still improved both yield and quality of the essential oil distilled by steam from bay leaves. Sodium, potassium, and calcium chlorides, potassium and ammonium nitrates, and sodium triphosphate, carbonate, and sulfate were all treated. Five times normal sodium carbonate and all concentrations of the triphosphate proved excessive, and the contents of the still turned black. Of the three concentrations of calcium chloride, the 5-N solution caused the content of the still to turn dark after the distillation had continued long enough, and thereafter no more oil was obtained. This effect is attributed to the presence of carbonate in the calcium chloride. The nonalkaline salts increased the yields to a greater extent at the higher concentrations, up to 5 N, potassium nitrate giving the largest increase.

Effect of mill operations on the number of bacteria found in paper and paperboard products, J. R. SANBORN. (N. Y. State Expt. Sta.). [*Tech Assoc. Pulp and Paper Indus.*], *Tech. Assoc. Papers*, 25, ser., No. 1 (1942), pp. 336-340.—Many mills have found bacteriological count standards for paper and paperboard products to be useful guides for efficient mill operation and satisfactory quality. Studies have revealed important sources of microbiological growths which, unless properly controlled, may frequently be responsible for high counts in pulp, paper, and paperboard. Where micro-organisms are allowed to develop at one or more focal points, many varieties and species are usually encountered in stock systems which may also be found in finished paper and paperboard products. Various physicochemical and biological factors in mill systems exert a protective action on micro-organisms which enables them to resist the lethal effects of chemicals and heat. These factors are still not well understood and should receive careful and critical study.

AGRICULTURAL METEOROLOGY

Physical elements of geography, V. C. FINCH and G. T. TREWARTHA (*New York and London: McGraw-Hill Book Co.*, 1942, 2. ed., pp. X+641, pls. 10, figs. [371]).—This book is designed to supply textual material covering the physical elements of geography in a form particularly suited to classroom discussion in beginning courses of college geography. Of special interest to agricultural meteorology are the following chapters: Air temperature (including isolation) (pp. 33-57); atmospheric pressure and winds (pp. 58-92), atmospheric moisture and precipitation (pp. 93-110); storms and their associated weather types (pp. 111-154); the tropical rainy climates (A) (pp. 160-176); the dry climates (B) (pp. 177-193); the humid mesothermal climates (C) (pp. 194-217); the humid microthermal climates (D) (pp. 218-238); polar climates and highland climates (pp. 239-252); plains in dry climates (pp. 374-386); water resources of the land (pp. 465-482); and the appendix on supplementary climatic data for selected stations (pp. 601-602).

Physical climatology, H. LANDSBERG (*State College: Pa. State Col.*, 1942, 2. ed., rev., pp. XII+283, figs. 79).—A slightly revised edition of the work previously noted (E. S. R., 86, p. 294).

Xerothermic theory, P. B. SEARS (*Bot. Rev.*, 8 (1942), No. 10, pp. 708-736).—This comprehensive review (80 references), after defining the theory and suggesting its importance, discusses its origins, the periods of dispute and of critical reexamination, current judgment, and the xerothermic theory in North America. The main assumption of the theory is that there was at least one segment of time since the last major glaciation during which the climate was drier and warmer than at present.

Aerobiology, edited by F. R. MOULTON ([Lancaster, Pa.: Science Press Ptg. Co.], 1942, pp. [10]+289, figs. [196]).—This symposium on aerobiology was presented at a meeting of the American Association for the Advancement of Science, Chicago, 1942. The individual papers, most of them provided with lists of literature references, are as follows:

Extramural.—The Field of Extramural Aerobiology, by E. C. Stakman (pp. 1-7) (Univ. Minn. and U. S. D. A.); Atmospheric Pollen, by R. P. Wodehouse (pp. 8-31); Air-Borne Fungus Spores as Allergens, by O. C. Durham (pp. 32-47); Microorganisms in the Upper Air, by B. E. Proctor and B. W. Parker (pp. 48-54); Microorganisms in Marine Air, by C. E. ZoBell (pp. 55-68) (Univ. Calif.); Local Aerial Dissemination of Plant Pathogens, by G. W. Keitt (pp. 69-77) (Univ. Wis.); Long Distance Dissemination of Plant Pathogens, by J. J. Christensen (pp. 78-87) (Minn. Expt. Sta.); and Insect Population and Migration in the Air, by P. A. Glick (pp. 88-98) (U. S. D. A.).

Intramural.—Air-Borne Infection as a Basis for a Theory of Contagion, by W. F. and M. W. Wells (pp. 99-101); Behavior of Microscopic Particles in the Air and in the Respiratory System, by T. F. Hatch (pp. 102-105); Atomizing of Mouth and Nose Secretions Into the Air as Revealed by High Speed Photography, by M. W. Jennison (pp. 106-128); Disinfection of Air by Air Conditioning Processes, by C. P. Yaglou and U. Wilson (pp. 129-132); The State of Suspension of Bacteria in the Air as Measured by Settling Rates, by E. B. Phelps (pp. 133-137); Standardization of Ultraviolet Lamps Used as Sources of Germicidal Radiation, by W. W. Coblenz (pp. 138-141); The Physiological Effects of Ultraviolet Radiation, by H. Laurens (pp. 142-155); Abiotic and Sublethal Effects of Ultraviolet Radiation on Microorganisms, by A. Hollaender (pp. 156-165); Production and Control of Bactericidal Ultraviolet Radiation, by H. C. Rentschler (pp. 166-170); Characteristics of Some Low Voltage Type Germicidal Lamps, by L. J. Buttolph (pp. 171-180); Practical Considerations in the Design and Maintenance of Ultraviolet Air Sanitation Equipment, by F. W. Robinson (pp. 181-183); Characteristics of Sperti, Inc., Ultraviolet Lamps, by J. Kruetzkamp (pp. 184-185); The Importance of Air-Borne Pathogenic Bacteria in the Operating Room—A Method of Control by Sterilization of the Air With Ultraviolet Radiation, by D. Hart (pp. 186-192); The Growth-Promoting Role of Ultraviolet in Wound Healing, by L. G. Nutini (pp. 193-196); Clinical and Laboratory Observations in the Use of Ultraviolet Radiation in Surgery, by C. J. Kraissl and D. A. W. and M. H. Wilson (pp. 197-205); Environmental Control of Epidemic Spread of Contagion, by W. F. and M. W. Wells and T. S. Wilder (pp. 206-211); The Spread of Pneumococcal and Streptococcal Infections in Hospital Wards and in Families, by M. Finland (pp. 212-222); On the Control of Cross-Infections in a Children's Hospital, by E. C. Robertson and M. E. Doyle (pp. 223-227); Studies of Cross-Infection in the Infants' Hospital in Boston, by G. L. Brooks, U. Wilson, and K. D. Blackfan (pp. 228-232); Effect of Irradiation of Air in a Ward on the Incidence of Infections of the Respiratory Tract With a Note on Varicella, by L. H. Barenberg, D. Greene, L. Greenspan, and B. Greenberg (pp. 233-236); Studies on the Aerial Transmission of Hemolytic Streptococci in a Rheumatic Fever Hospital, by S. M. Wheeler and T. D. Jones (pp. 237-241); Observations on the Control of Respiratory Contagion in the Cradle, by I. Rosenstern (pp. 242-250); The Controlled Physical Environment for the Premature and Older Infant, by C. C. Chapple (pp. 251-253); The Control of Cross-Contamination by the Use of Mechanical Barriers—I, Principles and Instrumentation for Absolute and Partial Control With **Fixed** and Circulating Hosts, by J. A. Reyniers (pp. 254-259); The Control of Cross-Contamination by the Use of Mechanical Barriers—II, Testing the Efficiency of Mechanical Systems for Controlling Cross-Infection, by J. A. Reyniers

and P. C. Trexler (pp. 260-266) ; The Bactericidal Effects of Daylight and Sunlight on Chained Gram Positive Cocci in Simulated Room Environment—Theoretical and Practical Considerations, by L. Buchbinder (pp. 267-270) ; Sterilization of Air by Means of Germicidal Aerosol Mists and Vapors, by O. H. Robertson, E. Bigg, T. T. Puck, B. F. Miller, and Z. Baker (pp. 271-280) ; Recent Experiences in England With Special Reference to the Importance of Dust, by M. Van Den Ende and C. H. Andrewes (pp. 281-283) ; and Air-Borne Infection and Experimental Air-Borne Disease, by W. F. and M. W. Wells, S. Mudd, M. B. Lurie, and W. Henle (pp. 284-289).

[Reports, permanent research-committees, section of hydrology] (*Amer. Geophys. Union Trans.*, 22 (1941), pt. 3, pp. 660-665, 697-734, 906-915, 944-945, 953-1005, 1029, figs. 26).—The following are of interest to agricultural meteorology ; Interception of Rainfall by Mature Lodgepole-Pine, by H. G. Wilm and C. H. Niederhof (pp. 660-665) (U. S. D. A.) ; Considerations on an Index to Measure Effective Rainfall, by J. G. Montes (pp. 697-703) ; Long-Term Constancy of Rainfall, by C. F. Merriam (pp. 703-707) ; Measurements of the Fall-Velocity of Water-Drops and Raindrops, by J. O. Laws (pp. 709-721) (U. S. D. A.) ; Extending the Forecasts of Temperature for the Prediction of Stream-Flow From Snow-Melt, by R. K. Linsley (pp. 722-726) ; and Hydrometeorology of the San Juan River Basin, Mexico, by A. G. Quintero (pp. 726-734). Reports of permanent research committees include Report of Committee on Transpiration and Evaporation, 1940-41, by J. Kittredge (pp. 906-915) (Univ. Calif.) ; Report of Committee on Rainfall, 1940-41, by M. Bernard (pp. 944-945) ; Annual Report of the Committee on Snow, 1940-41, by J. E. Church (pp. 953-979) (Nev. Expt. Sta.) (with appendix, List of Current Publications on Snow and Ice, by C. Elges, R. W. Burhoe, and L. Jacchia (pp. 981-1005) (Nev. Sta. et al.) ; and Report of Research-Committee of Eastern Snow-Conference, by G. A. Hathaway, C. F. Merriam, and J. Sweet (p. 1029).

Regionalization of the United States on a precipitation basis, S. S. VISHNER (*Ann. Assoc. Amer. Geog.*, 32 (1942), No. 4, pp. 355-370, figs. 27).—The main purposes of this article are to make more readily available the essence of numerous detailed precipitation maps, to offer a number of new precipitation maps, and to present concisely for each of the regions facts concerning the precipitation, many of which have not been generally known. There are many bibliographic footnotes.

Rainfall and runoff in the upper Santa Cruz River drainage basin, H. C. SCHWALEN (*Arizona Sta. Tech. Bul.* 95 (1942), pp. [3]+421-472, pls. 2, figs. 16).—The area as here considered includes that of the Santa Cruz River and its tributaries above Rillito Station on the Southern Pacific Railroad, contains some 3,500 sq. miles of which 380 are in Mexico, and varies in elevation from 2,060 ft. above sea level at Rillito Station to over 9,000 ft. on several of the mountain peaks. There are two distinct rainy seasons—one from the latter part of June and through September and the other through December to March, inclusive. In general, the summer rains comprise over 50 percent of the total and occur almost entirely in the middle or late afternoon as thundershowers. They are usually local, of short duration, and sometimes torrential in character, but the entire drainage area is usually subject to rainfall. Winter rains result from general cyclonic storm movements passing eastward, are usually of wide areal extent, several days' duration, and slow, steady intensity, and are not as dependable in amount or time of occurrence as the summer rains. The mean annual rainfall varies from a minimum of about 11 in. in the valley to over 37 in. at 8,000 ft. In the mountain areas with marked relief the rainfall in general increases directly with elevation. The mean annual rainfall for the drainage

area was found to be 16.5 in., or equivalent to about 3.1 million acre-ft. per year. Variations at individual stations have been from less than 50 to more than 200 percent of the mean annual rainfall.

The Santa Cruz River and its principal tributaries are purely ephemeral in character. Floods from summer rains are short-lived, but those from winter rains are in general of longer duration with lower flood crests. The minimum, maximum, and mean annual discharges and the peak discharges of the Santa Cruz River and Rillito Creek are presented. Frequency studies indicate that there is about a 1 percent chance of occurrence of a flood peak of 16,500 sec.-ft. in the Santa Cruz River and of 32,000 sec.-ft. in Rillito Creek.

But for years of exceptionally high rainfall and runoff, an extremely low percentage of the total rainfall was found to appear as runoff in the lower portion of the drainage area. However, the ratios of runoff to rainfall for individual storms, seasonal periods of excessive rainfall, and for small drainage areas at high elevations are much higher. It is apparent that the storm area, duration and intensity of the rainfall, topography and slopes of the drainage area, and the amount of water stored in the soil are the factors determining the amount of runoff and resulting runoff-rainfall ratio. The total amount of rainfall without consideration of these factors shows but little correlation with the runoff.

The weather of Scotland in 1941, W. A. HARWOOD (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 54 (1942), pp. 205-227).—This consists of a general description of the weather from month to month and a selection of rainfall returns in which each county of Scotland is represented by one or more stations. Temperature readings, unless otherwise stated, are from thermometers exposed in the regulation "Stevenson Screen."

SOILS—FERTILIZERS

The soils that support us: An introduction to the study of soils and their use by men, C. E. KELLOGG (*New York: Macmillan Co.*, 1941, pp. XI+370, figs. 80).—This is a popular discussion in which "technical discussions and words have been avoided in order to deal with the main principles simply." Despite this avoidance of technicalities, however, much of the modern science of the soil is outlined for the general reader. The contents are arranged under the headings: In the first place, the building material for soils, life and the soil, the parts of a soil, the rains come and go, soils of little places and of big places, soils of the grasslands, soils of the desert, soils of the forested lands (temperate), soils of the forested lands (warm and tropical), men use the soil, soils for different crops, plowing and digging, fertilizers and lime, control of water on the soil, when do soils "wear out," planning the use of the soil, and soil and our future.

[**Soil and fertilizer investigations by the North Carolina Station**]. (Partly coop. U. S. D. A. et al.). (*North Carolina Sta. Rpt. 1941*, pp. 60-66, figs. 2).—These included the following subjects: Effect of grade of tobacco rows on drainage and erosion control; effect of heavy summer rain on soil losses from cultivated land; value of ground cover for controlling erosion; effect of compost, woods litter, and manure on soil losses and yields from cotton areas; a flood control study made in the mountains; soil acidity relationships as an aid in the classification of soils; the downward movement of lime in soils; effect of potash and magnesia losses on soil acidity; the necessity of boron for truck crops produced in the Wilmington area; value of copper on soils in southeastern North Carolina; increased yields of lespedeza and oats by lime and phosphate at the Piedmont Substation; and superiority of fertilizers neutralized with finely

ground dolomitic limestone as compared with those neutralized with coarsely ground limestone.

[**Soil investigations by the Vermont Station**] (*Vermont Sta. Bul.* 495 (1942), pp. 16-19).—Reported upon by A. R. Midgley are the effect of amendments in conserving the fertilizer value of cattle manure, the addition to which 10 lb. of boric acid per ton prevented nitrogen loss by volatilization for a period of fully 5 or 6 weeks and practically eliminated the fly population of the manure; effect of lime and organic matter on boron fixation and availability in soils; pasture improvement studies; effect of slope, plant cover, and contour tillage on soil erosion and water runoff; maintenance of permanent hay lands; and phosphorus fixation and unavailability in podzolized soils.

Nomograms for rapid calculation of soil density, water content, and total porosity relationships, G. B. BODMAN. (Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 883-893, figs. 3).—Two nomograms and a table are presented in an attempt to facilitate calculations involving some of the most simple and elementary properties of soils in relation to water content and well-established empirical observations concerning penetration.

Volume-freezing-point relations observed with new dilatometer technique, A. B. C. ANDERSON and N. E. EDLFFSEN. (Calif. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 3, pp. 221-232, figs. 4).—Irreversible changes in the volume-freezing-point relations of a soil containing more water than is required to saturate it are produced by the presence of large quantities of dissolved air in the soil moisture. The dissolved air is expelled to form throughout the soil moisture great numbers of entrapped air bubbles, of which the volume depends on their temperature at the moment of entrapment. A new dilatometer technic permitting the elimination of the dissolved air is described. Seemingly irreversible changes were produced by the formation of minute water-vapor cavities around each soil particle whenever the temperature of the frozen water-soil mass was raised. This gave rise to a family of parallel curves (representing the volume-freezing-point relations of the soil under all conditions), the initial points of which all lie on a locus which is believed to represent the true volume-freezing-point relations of the soil in the absence of cavities. This locus is quite different, however, from that previously taken to represent the true volume-freezing-point relations of a soil more than saturated. Two methods for obtaining this locus are presented, together with a theoretical explanation of the reproducible family of curves representing the true volume-freezing-point relations of a soil under all conditions.

Electrochemical relations between the root system and the soil, H. LUNDEGÅRDH (*Soil Sci.*, 54 (1942), No. 3, pp. 177-189, figs. 3).—The surface layer of the protoplasm called the Z-layer, an amphoteric colloid with predominatingly acidic properties in contact with a solution containing ions, exhibits on both sides of the boundary an electrical double layer of opposite signs, such that the magnitude of the charge, in terms of H-ion concentrations, is shown by the equation

$$-P. D. = \frac{RT}{nF} \ln \frac{[H^+]_z}{[H^+]_0},$$

in which $[H^+]_z$ is the concentration of H ions in the Z-layer and $[H^+]_0$ is the concentration of H ions in the medium, and R , T , n , and F have their usual respective significations. As between the soil and the cell wall and liquid interphase, a similar relation exists and may be expressed by replacing the quantity $[H^+]_z$ by the quantity $[H^+]_i$ in the equation just stated. The difference between $P. D.$, and $P. D.$, respectively, between the Z-layer and the interphase and between the soil colloids and the interphase can, therefore, be expressed as

$$P. D._2 - P. D._1 = \frac{RT}{nF} \ln \frac{[H^+]_2}{[H^+]_1},$$

a quantity which was determined by means of a device using a cathode-ray oscillograph as a voltmeter and a compensation circuit for calibration. A theory of the electrochemical properties of the surface of living roots, which control the absorption of nutrient ions, is developed and extended to the boundary between the roots and the soil. A number of determinations of the potential of cereal plants, grown in soil to which nutrient salts or commercial fertilizers were added, are discussed in relation to the theoretical considerations.

Field study of response of the electrical resistance of 2- and 4-electrode plaster of paris blocks to variations in soil moisture, N. E. EDLEFSEN, A. B. C. ANDERSON, and W. B. MARCUM. (Calif. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 4, pp. 275-279, figs. 2).—Plaster of paris blocks containing two electrodes (E. S. R., 83, p. 307) have been compared by two of the present authors with 4-electrode blocks (E. S. R., 88, p. 161) in laboratory experiments. The work here noted extended the trial to field conditions with the same comparative result, namely, that the 2-electrode blocks gave practically the same degree of reproducibility as did the 4-electrode system.

From results both in the laboratory and in the field it is concluded that at field capacity and higher moisture contents, for all the soils studied, the resistances of the 2-electrode blocks are nearly constant, having a value between 400 and 600 ohms, whereas the resistances when all the readily available moisture is used are in the neighborhood of 500,000 ohms. The fact that the blocks, in all the soils tested, have approximately the same resistances at the permanent wilting percentage makes them especially useful as indicators of need for irrigation. The resistance increases very rapidly with changes in moisture content in the neighborhood of the permanent wilting percentage.

Present and future agricultural use of ground-water in a portion of the Southwest, H. P. BURLEIGH. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, [23] 1942, pt. 1, pp. 15-19).—It is proposed to divide the ground-water areas in the Southwest into the two general classes (1) ground waters occurring in the relatively narrow alluvial channels along rivers, their major source of recharge being usually the surface discharge of the river coursing over the alluvium; and (2) ground-water areas in which the aquifer is exposed or underlies areas of considerable and irregular extent, and the major source of recharge usually is a portion of the rainfall. In class 1 ground-water areas there is a possibility of developing additional ground water, with an assured equivalent annual recharge, at a rate that probably will not exceed 122,000 acre-ft. annually. In three of the major areas of class 2, namely, the Winter Garden area, the San Luis Valley, and the Roswell Artesian area, total feasible development probably has been reached, as additional development appears precluded for legal and economic reasons. In the Estancia Valley area a probable total of about 20,000 acre-ft. can be developed. In the other two major areas, the Deming area in New Mexico and the various districts on the High Plains, the rate of development is entirely dependent upon the rapidity with which the water table is lowered beyond the point of profitable pumping, for in these areas pumped water comes from partial storage.

It is pointed out that major well-irrigation developments in the Southwest occur under conditions whereby the water table will eventually decline below the point of profitable pumping. It is, therefore, important that, as quickly as feasible, research efforts in the field of hydrology be intensified. Too little is known of the precise effect that varying rates of recovery will have upon the rate of decline of the water table. With a knowledge of the probable rates of lowering of the

water table, it is possible that more effective use of available water supplies would be made. In the field of agricultural research, knowledge that will lead to a more effective ratio between application and the actual consumptive requirements of crops must be attained. Application of ground water throughout the Southwest to crops that are not compatible with the general economy must be discouraged, and the application of ground water to crops most in harmony with the agricultural economy of the region must be encouraged.

Evaporation and consumptive use of water empirical formulas, H. F. BLANEY and K. V. MORIN. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, [23] 1942, pt. 1, pp. 76-83, fig. 1).—The authors show the development, in connection with the Pecos River joint investigation, of empirical formulas for estimating unit annual values of evaporation from free-water surfaces and consumptive use by native ground-water vegetation when records of temperature, daytime, and humidity are available. The formulas are developed for areas in which there is ample water to take care of evaporation and transportation. Of their use, the authors note that the evaporation formula may be used to estimate annual evaporation when a few monthly evaporation pan records may be missing, but monthly temperature and humidity data are available for the entire year; and that the consumptive-use formula is best adapted to native ground-water vegetation but may be used in estimating consumptive use by irrigated crops having access to an ample water supply, such as alfalfa, when some experimental evaporation transportation data for the crop are available, together with records of evaporation, temperature, and humidity.

Some evidence regarding the kind and quantity of sediment transported by density-currents, H. S. BILL. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, [23] 1942, pt. 1, pp. 67-73).—Observations of numerous authors are cited as showing that both aqueous and atmospheric density currents can and do transport enormous quantities of fine sediment. Analyses of various dust falls and loess and bottom deposits are tabulated. It is noted, however, that these data are not adequate for making other than very rough estimates of the total volume of sediment moved in this manner, and the need for fuller information for use in the solution of silting and soil loss problem is emphasized.

Scour-control and scour-resistant design for hydraulic structures, B. T. MORRIS. (U. S. D. A.). (*Amer. Geophys. Union Trans.*, [23] 1942, pt. 1, pp. 69-67, figs. 8).—The author advocates hydraulic laboratory study of specific scouring problems and analysis of the general problem as a phase of the mechanics of sediment transportation. The factors controlling the ability of a stream to scour and having a significant bearing upon the problem are listed as (1) the amount of sediment brought into the region of scouring action by the stream, (2) the sediment-carrying capacity of the flow in the downstream channel, (3) the resistance of the bed and bank materials to dislodgment and entrainment, (4) the mixing or sediment-suspending power of the eddies produced in the scour zone, and (5) the velocity of flow through the scour zone.

In experiments here described and illustrated by photographs and drawings, a jet was directed vertically downward onto a submerged bed of well-sorted sand. It was shown that, regardless of the ultimate intensity of the jet, during the first instant of jet flow the jet was simply deflected as if by a slab of masonry (0.5 sec.). In the corner the velocity energy of the stream produced a stagnation pressure, tending to hold the sand grains down. Only through fluctuations and eccentricities of velocity and pressure distribution could grains be loosened under this stabilizing force. Away from the corner and downstream, the pressure gradient and the high velocities were soon able to move grains along the bed. The suspending action of the eddies resulting from the shock loss at the bend was

relatively unimportant. Particles were transported a short distance and deposited close to the corner. The removal of even a few grains of sand changed the outlines of the flow, however (25 sec.). The jet then entered a rounded pit and had to turn more than 90° in order to leave over the growing dune of deposited material. More intense eddies were produced and still the stream was carrying only a small amount of bed load. As the pit deepened (47-60 sec.) the face of the dune of deposited material steepened. When the angle of repose (approximately 30°) was exceeded, sliding took place (70 sec.), the direction of bed load motion reversed, and suspension became the only phase of transportation capable of removing sediment over the dune crest (110 sec.). The mixing system holding particles in suspension was composed of the eddies produced in the scour pit. The rate of growth of the scour hole became the rate of removal of particles suspended by the eddy system.

These experimental results are analyzed, and the application of their indications and of the five scouring control factors above enumerated to the design of structures are discussed.

Mechanism of water attack on dry cohesive soil systems, H. F. WINTERKORN (*Soil Sci.*, 54 (1942), No. 4, pp. 259-273, figs. 2).—The mechanism of water attack on dry cohesive soil systems was analyzed theoretically and on the basis of data obtained in experiments on five natural soils and on their homoionic modifications prepared by elutriation with the chlorides of the H-, Na-, K-, Mg-, Ca-, Ba-, Al-, and Fe-ions, respectively. Two main factors appeared to govern the consequences of the water attack: (1) The driving force or the affinity of the internal soil surface for water, and (2) the cohesive forces holding the system together. The relative magnitude of these forces was found to determine the general nature of the reaction. On the other hand, the speed with which the particular reaction occurs was shown to depend to a great extent on the permeability of the soil system and on the ease with which free and adsorbed gases may escape from the pore space. If this escape is prevented, a type of failure similar to an explosion, although liberating less energy than is usually associated with this term, may occur. The concept that the driving force is the affinity of the internal surface for water explains the behavior of certain moist cohesive soil systems which may be exposed to free water for any length of time without observable change. The affinity for water is satisfied in such systems, and no driving force for the water attack is left.

The experimental data obtained appeared to substantiate the developed theory as far as the erosive soils are concerned. With respect to the nonerosive soils the experimental techniques available did not furnish all the information necessary for testing, but no fundamental objections to the general theory appeared.

Runoff, percolate, and leaching losses from some Illinois soils, R. S. STAUFFER. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 9, pp. 830-835).—A continuation of work reported earlier (E. S. R., 78, p. 454) on runoff and percolation studies made with erosion-type lysimeters for several important soil types of Illinois. The soils were kept bare and not cultivated. Any growth was removed with as little disturbance of the soil surface as possible. There was found to be considerable variation in runoff and plant nutrients removed from the soils by leaching from the different soil types.

Controlling coastal sand dunes in the Pacific Northwest, W. T. McLAUGHLIN and R. L. BROWN (*U. S. Dept. Agr. Cir.* 660 (1942), pp. [2]+46, figs. 24).—A comprehensive account of the development, extent, and methods of control of coastal sand dune areas in the Pacific Northwest.

Influence of the chemical composition of organic matter on the development of mold flora in soil. T. L. MARTIN, D. A. ANDERSON, and R. GOATTS (*Soil Sci.*, 54 (1942), No. 4, pp. 297-302, figs. 4).—The authors' experiments showed that the higher the percentage of readily decomposable carbohydrate materials, i. e., sugars, starches, and some hemicellulose and cellulosic materials, the greater was the predominance of species of *Mucor* and *Rhizopus* in proportion to other molds present in a soil-organic-matter mixture. When a stable hemicellulose and cellulose fraction had been produced in the soil, little of the more easily decomposed carbohydrate material remaining, such molds as *Penicillium glaucum* and *Aspergillus niger* predominated. When lignin was the chief constituent remaining of the original plant material, species of *Cladosporium*, *Alternaria*, and *Aspergillus minutus* were found in the greatest numbers.

Distribution of antagonistic actinomycetes in nature. S. A. WAKSMAN, E. S. HORNING, M. WELSCH, and H. B. WOODRUFF. (N. J. Expt. Stas.). (*Soil Sci.*, 54 (1942), No. 4, pp. 281-296).—From various soils, 244 cultures were isolated. Of these, 106 cultures or 43.4 percent possessed some antagonistic properties, and 49 cultures or 20 percent were highly antagonistic toward bacteria and fungi. Similar relations were observed by examining a large series of well-identified organisms kept for a number of years in a type culture collection. Although antagonistic forms were also found among the genera *Proactinomyces* and *Micromonospora*, they were most abundantly represented by members of the genus *Actinomyces*.

Some of the more active cultures were studied in detail, and several antibiotic substances were isolated. These antibiotic substances were found to vary greatly in their chemical composition and in their mode of action. They were shown to be highly selective in nature, affecting different organisms in a different manner. They were not only bacteriostatic but also bactericidal. Some were highly bacteriolytic, a property widely distributed among certain types of actinomycetes.

The microbiological oxidation of ammonia in desert soils.—I, Threshold pH value for nitrification. A. B. CASTER, W. P. MARTIN, and T. F. BUEHNER (*Arizona Sta. Tech. Bul.* 96 (1942), pp. [3]+475-510, figs. 6).—A laboratory incubation study was conducted with six typical but widely separated desert soils of varying texture to obtain information on the rate of microbial oxidation of ammonia in comparison with other types of nitrogen fertilizers commonly used. The results given in this publication are concerned mainly with the pH relationships involved in nitrification.

Dependence of the rate of corrosion of buried iron on the oxygen supply of the soil. H. VINE (*Soil Sci.*, 54 (1942), No. 3, pp. 159-176).—The author determined the loss of weight, due to corrosion, of strips of iron driven to various depths in the soil at a number of points in Trinidad, B. W. I., during the rainy season and removed, cleaned, and weighed after 2, 4, or 6 weeks. The measurements were replicated, and the statistical significance of the results was calculated. The loss in weight decreased very markedly with increasing depth, especially during the wettest periods. Except at one site, where, it is believed, pH values of 4.4 and 4.7 in the top and second 4-in. layers of soil may have been the cause of a high degree of corrosiveness, the losses in weight were independent of acidity and were closely related to the oxygen supply as indicated by texture and drainage. None of the soils were saline, calcareous, or gypseous. Manometric observations and gas analyses of three portions of a mixture of sand and clay, virtually free of organic matter and adjusted to different pH values, in which pieces of iron were allowed to corrode, showed that oxygen absorption predominated over hydrogen evolution when the oxygen

supply was plentiful, but that the latter also played a part; that it alone might be responsible for corrosion in anaerobic conditions; and that its rate increased with acidity.

Determination of active manganese in soil, G. D. SHERMAN, J. S. McHARGUE, and W. S. HODGKISS. (Ky. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 4, pp. 253-257).—The active manganese in the soil is defined as including the readily available manganous manganese and the easily reducible manganic manganese. The manganous-manganic manganese exists in an oxidation-reduction equilibrium reflecting the state of oxidation of the soil. The status of the manganous-manganic manganese equilibrium was found to be establishable by a measurement of the active manganese. In a procedure described, the forms of active manganese are determined in the leachates from successive extractions of the soil with distilled water, neutral normal ammonium acetate, and neutral normal ammonium acetate solution containing 0.2 percent hydroquinone. It is claimed that this procedure for determining the active manganese will identify (1) neutral to alkaline soils that are manganese-deficient for plant growth, (2) strongly acid soils that will become manganese-deficient with liming, and (3) soils with high and low capacity to oxidize added manganese salts.

Significance of Donnan equilibria for soil colloidal systems, L. E. DAVIS. (Univ. Calif.). (*Soil Sci.*, 45 (1942), No. 3, pp. 199-219, figs. 2).—In this paper emphasis is placed on an exact thermodynamic treatment. The customary discussion, with reference to clay systems, is found to be insufficient. A brief description of Donnan systems and Donnan equilibria is followed by a critical discussion of the thermodynamics of Donnan equilibria. The application of these principles to ideal and to real systems and the significance of Donnan equilibria with respect to soil colloids are considered. The expression Donnan equilibria is applied only to equilibria between phases upon which measurements can be made and not to equilibria between microregions in a suspension such as the "micellar" and "intermicellar" regions. For real systems, such approximate generalizations as the ion concentration product principle are shown not to be adequate. It is pointed out, however, that nothing is gained by substituting the term "activity" for "concentration" in a discussion, unless the quantities which have been measured are actually activities rather than concentrations.

Upon the basis of the conclusion that, although activities of electrolytes are thermodynamically definable, the individual activities of ions are not, it is suggested that the use of the concept of ionic activities be avoided; also that the importance of the Donnan equilibrium as a regulative principle in soil chemistry has been greatly overemphasized, although investigation of the Donnan equilibrium can be used experimentally in the study of certain soil colloidal properties.

Forest soils: Origin, properties, relation to vegetation, and silvicultural management, S. A. WILDE (*Madison, Wis.: Author, 1942, 2. ed., rev., pp. 319, figs. 65*).—A comprehensive treatment of the subject of forest soils intended to meet some of the needs of men engaged in forestry and related branches of land use. An extensive listing of publications related to the subject is given. The five parts of the mimeographed publication include genesis of forest soils, soil as a medium for tree growth, analysis of forest soils, forest soils in relation to silviculture and forest management, and management of forest nursery soils.

Soil-freezing and forest-cover, K. T. BELOTELKIN. (U. S. D. A. et al.). (*Amer. Geophys. Union Trans.*, [22] 1941, pt. 1, pp. 173-175, fig. 1).—Measurements of depth of frost in the ground were made at the Gale River Experimental Forest in northern New Hampshire. Under forest canopies soils did not begin freezing until continuous low temperatures set in about the beginning of December. Moisture present in the litter, humus, and upper layers of the mineral

soil formed snowlike crystals, enabling the soil to maintain a good degree of permeability far into the winter. Soils in the open field, on the other hand, began losing their permeability in early November, when they began freezing solidly for several days at a time. Observations made during and after a heavy rain in December 1937 showed that under the forest canopies most of the frost left the ground. What frozen patches remained in the forest were saturated with freely moving water. In the open field water remained standing in slight depressions or ran freely along the slope. Under the forest cover no traces of free water were observed on the surface during or after the rain. Thawing began and was completed earliest in the hardwood stand. The open field ranked second in this respect, followed by the spruce flat and spruce swamp in the order named. Snow cover affects soil freezing to such an extent that even slight trampling of the snow, thereby increasing its conductivity, was found to affect the next re-measurement greatly if this were taken too near the trampled area. Thawing of the ground from the surface was found not to begin until the snow has melted; that from the bottom starts somewhat earlier. Forest litter protects the soil from freezing and delayed the penetration of the frost. Under softwood stands frost remained in the ground longer than in the open or in hardwoods. From 5 to 10 days (in the swamp even more) before the last vestige of frost has disappeared, however, small patches with no frost may be found which would provide channels for infiltration of water.

In poorly drained soils frost was found to penetrate deeper and to stay in the ground longer than in soils with better drainage. In their influence on soil freezing, fine-textured soils resembled poorly drained soils. Coarse-textured soils resembled better-drained soils.

The relation of various types of vegetative cover to soil drift, A. E. COLDWELL, P. R. LOEWEN, and C. J. WHITFIELD. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 8, pp. 702-710).—Results from wind erosion investigations are given for two areas in the vicinity of Dalhart, Tex., as determined from measuring erosion conditions along straight lines of comparatively great lengths, crossing fields with different covers. Changes in elevation of ground surface were measured from year to year. The recorded changes in elevation, caused largely by wind erosion, were found to vary greatly under different conditions of vegetative cover.

Utilization of absorbed phosphate by cotton and oats, R. COLEMAN. (Miss. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 4, pp. 237-246, figs. 2).—Cotton and oats supplied with a nutrient solution but with only that phosphate which had been adsorbed by the clay against acid and alkaline extracting solutions grew well on relatively small quantities of adsorbed phosphate whether it was held by the kaolinic or the montmorillonitic clay, and the plants utilized a large percentage of the adsorbed phosphate present. Of the methods studied, Truog's (E. S. R., 64, p. 312) was the most effective in removing the readily available phosphate from the clays, but it failed to remove much phosphate that was available to the plants.

Crop response to potash fertilization on important Ohio soils in relation to plant available potassium, S. R. OLSEN (Ohio State Univ., Abs. Doctoral Diss., No. 38 (1942), pp. 211-219).—The response of corn to potash was determined for six Ohio soils from 1939 to 1941. Available potash in each soil was determined by chemical, Mitscherlich, and Neubauer methods. Field response to potassium was of the same order as was indicated from amount of available potassium measured by all of the methods.

Potash available to crops unless lost by erosion, C. D. HOOVER (Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 11, p. 7).—Removal of potash in harvest

crops and losses from leaching are small in comparison with the amount of potash applied in the average mixed fertilizer. Most serious losses of potash take place from erosion, effective control of which would, therefore, result in building up the supply of soil potash.

Relation of liming to efficiency of fertilizers, W. R. PADEN. (S. C. Expt. Sta.). (*Com. Fert.*, 65 (1942), No. 5, pp. 22-25).—Experimental results lend further support to the idea that liming acid soils increases the efficiency of fertilizers. The author points out that at the present time, when fertilizers are difficult to obtain and when efficiency is so important, every possible effort should be made to apply limestone to soils having moderate to strong acid reactions.

Effect of dolomitic limestone on soils and crops when used as a neutralizing agent in complete fertilizers, E. R. COLLINS and J. J. SKINNER. (N. C. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 894-901, fig. 1).—Non-acid-forming fertilizers made with dolomitic limestone produced significantly higher yields of cotton, sweetpotatoes, and Irish potatoes than were obtained with acid-forming fertilizers under coastal plain soil conditions in North Carolina. Neutralizing the fertilizer with dolomitic limestone maintained soil pH at approximately the original level, increased total magnesium in the plant and the available magnesium in the soil of the root zone, and increased total calcium in the plant with no appreciable change in the ultimate available calcium content of the soil or the potash content of the plant, indicating no appreciable liberation or fixation of the soil and fertilizer potash.

Many soils, crops, may require boron for highest yields, R. COLEMAN (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, p. 7).—Results of soil analyses showed that many soils in Mississippi may need applications of boron. This was found to be especially true in the southern part of the State.

The selenium content of vegetation and the mapping of seleniferous soils, O. E. OLSON, D. F. JOENLIN, and A. L. MOXON. (S. Dak. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 7, pp. 607-615, figs. 2).—The selenium content of *Agropyron smithii* was reported as being a relative index to the amount of selenium in soils which is available to common range plants.

Inspection of commercial fertilizers for 1942, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 343 (1942), pp. [1]+7).—A summary of analysis of 84 brands of fertilizer and fertilizer materials sold in New Hampshire in accordance with the provisions of the State fertilizer law.

Commercial fertilizers—Concerning nitrogen supplies in war time, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul.* 496 (1942), pp. 27).—A statistical summary of the usual fertilizer analyses. There is also included a discussion of nitrogen supplies in wartime, as well as suggestions on fertilizer usage and a discussion of acid and nonacid fertilizers.

Wartime recommendations on the use of commercial fertilizer, O. T. COLEMAN and A. W. KLEMM (*Missouri Sta. Cir.* 242 (1942), pp. [4], fig. 1).—Fertilizer recommendations based upon analyses selected by the U. S. War Production Board are given for the principal crops of Missouri according to previous land use of the area to be used. Suggested rates and methods of application are also given.

Delta soils vary in fertilizer needs for cotton growth, R. KUYKENDALL (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, p. 2).—The importance of the proper program of fertilization for obtaining maximum yields on soil types of the Yazoo-Mississippi Delta is pointed out. The most profitable practice

was found to be winter legumes followed by cotton and fertilized with 20 lb. per acre of commercial nitrogen.

A fertilizer triangle for small whole number fertilizer ratios, C. S. SLATER. (Md. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 955-957, figs. 2).—Two figures are presented to show the location of small whole-number ratios at each intersection of three ratio lines and the distribution of small whole-number ratios that can be expressed in numbers not greater than six, using a modification of the equilateral triangle commonly used to illustrate ratio relationships.

Availability of adsorbed ions to plants growing in quartz sand substrate, F. S. SCHLENKER. (R. I. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 4, pp. 247-251, figs. 6).—The author has previously shown (*E. S. R.*, 84, p. 306) that when potassium, calcium, and magnesium permutites and nitric, sulfuric, and phosphoric acid aniline blacks are suspended in water, solutions of ions that will support the growth of plants are produced. The present paper reports experiments which further show that when the adsorption complexes are mixed with quartz sand and the whole mass is adjusted to an adequate moisture content, the adsorbed ions become available and support growth. A comparison of equal quantities of soluble salts and adsorbed ions showed that the adsorbed ions produce the greater plant growth. In general, crop yields, whether measured in terms of fresh weight or height, paralleled the fertilization.

Factors affecting the interaction between organic matter and montmorillonite, L. E. ENSMINGER. (Idaho Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 3, pp. 191-197).—The combining capacity of gelatin was found to increase with acidity, at least to pH 0.5. The basicity of albumen increased with acidity to a pH value between 2.8 and 1.5 and remained constant. The equivalent combining weight of the gelatin cation was greater for montmorillonite than for hydrochloric acid. The equivalent combining weight of the albumen cation was about the same for montmorillonite and hydrochloric acid. The base-exchange data indicated that 12 percent of the nitrogen in gelatin and 8 percent of that in albumen are basic at pH 2.8. Composting increased the sorption of straw and alfalfa leaf meal by montmorillonite. Grinding increased the sorption of alfalfa leaf meal and its composts but had little effect on the sorption of straw. Organic materials containing alfalfa were sorbed to a greater extent than was straw. Acidity increased the sorption of composted alfalfa leaf meal more than it did that of the original material. The addition of lignin to gelatin decreased the basic properties of the gelatin.

Influence of leguminous plant additions on the organic matter content and available nutrient supply of southern soils, F. MOSER. (S. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 8, pp. 711-719, fig. 1).—Plant materials were added as green manures, hay mulches, and incorporated with the soil to determine the effect of the method of addition on the organic matter content, available soil nutrients, and crop yields. While the average content of organic matter in the cultivated soils of the Piedmont section of South Carolina is about 1 percent, the organic matter added by growing vetch, lespedeza, and crimson clover raised the percentage to 1.5. Growing lespedeza continuously on the same area for a number of years increased the organic matter to about 2.5 percent. Adding the leguminous plant materials increased the nitrate, acid-soluble phosphorus, and replaceable potassium content. The leguminous soil treatments also gave increases in yield with sorghum and rye used as the indicator crops.

Phosphate reserves of Utah, revised estimate, J. S. WILLIAMS and A. M. HANSON (*Utah Sta. Bul.* 304 (1942), pp. 24, figs. 2).—As a supplement to work previously reported in Bulletin 290 (*E. S. R.*, 82, p. 156), this publication presents

a revised statement of Utah's reserve of phosphate by areas, by counties, and by quality of rock.

Chemical properties of various commercial superphosphates before and after ammoniation, E. W. HARVEY and L. V. ROHNER (*Amer. Fert.*, 97 (1942), No. 8, pp. 5-6, 24-26).—The P_2O_5 reversion behavior of ammoniated commercial superphosphates during storage at various temperatures may differ markedly from product to product. Variations in the fluorine, iron, aluminum, and moisture contents of these products may be factors contributing to these differences in behavior. However, there are no consistent correlations between the contents of any of these and the content of reverted P_2O_5 after ammoniation and storage at different temperatures. In general, a significantly lower citrate-insoluble content was indicated by the use of the 0.5-gm. method than by the 1-gm. method of determination. The extent of this reduction varied appreciably with the composition of the ammoniated superphosphate and with the storage conditions.

This study has not produced data which serve to simplify the problem of reversion, rather it raises questions relative to the validity of any explanations which attribute reversion primarily to any one constituent, e. g., formation of $3[Ca_3(PO_4)_2].CaF_2$.

Waste pond phosphate compared with rock phosphate and superphosphate as a fertilizer, G. W. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 9, pp. 823-829).—Greenhouse and field experiments indicate that superphosphate is far superior to waste pond or rock phosphate as a source of phosphorus for the growth of cotton, sorghum, hairy vetch, and Austrian Winter peas. Waste pond and rock phosphate were found to be about equal in their ability to supply phosphorus for plant growth. Increasing the application of waste pond or rock phosphate from 48 to 384 lb. of P_2O_5 per acre did not result in any appreciable increase in crop yield.

AGRICULTURAL BOTANY

Division of Agricultural and Food Chemistry of the American Chemical Society: Abstracts of papers presented at Memphis, Tenn., April 20 to 24, 1942 (*Amer. Chem. Soc. Mtg.*, 103 (1942), *Abs. Papers*, pp. 1A-27A).—The following, of interest to botany, are included: The Effect of Some Minor Element Compounds on the Yield and Mineral Content of Oats, Wheat, and Potatoes, by J. S. McHargue, R. H. Hageman, G. D. Sherman, W. S. Hodgkiss, and E. S. Hodge (pp. 3-4); Zinc in Animal and Plant Nutrition, by E. Hove (pp. 5-6); The Effect of Source on Magnesium Absorption by Tobacco, by T. R. Swanback (pp. 13-14) (Conn. [New Haven] Expt. Sta.); Waxy Maize Starch—A Possible Competitor for Tapioca, by R. M. Hixon and G. F. Sprague (p. 16) (Iowa Sta.); The Structure of Starch and the Mechanism of Its Formation, by W. Z. Hassid and R. M. McCready (pp. 16-17) and Studies on Photosynthesis Using the Radioactive and Stable Isotopes of Carbon, Hydrogen, and Oxygen, by S. Ruben, M. D. Kamen, W. Z. Hassid, M. Randall, and T. H. Norris (pp. 17-18) (both Univ. Calif.); and The Fluorine Content of Certain Plants as Affected by Various Fertilizer Treatments, by W. H. MacIntire, S. H. Winterberg, and J. G. Thompson (p. 21) (Tenn. Sta. et al.).

Abstracts of dissertations presented by candidates for the degree of doctor of philosophy, autumn quarter, winter quarter, 1941-42 (*Ohio State Univ., Abs. Doctoral Diss.*, No. 38 (1942), pp. VI+286, figs. 35).—The following are of interest to agricultural botany: A Critical Study of the *Avena* Test and Extraction Methods Used in Plant Hormone Investigations and Their Application to Certain Horticultural Problems, by W. P. Judkins (pp. 61-68); The

Effect of Culture Filtrates on Photosynthesis and Respiration in *Chlorocella vulgaris*, by C. A. Swanson (pp. 257-262); and The Formation of Adventitious Roots in *Forsythia suspensa*, *Ribes alpinum*, and *Caragana arborescens*, by J. C. Swartley (pp. 263-268) (coop. Cornell Univ.).

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 44 (1942), No. 3, pp. 387-395).—Abstracts of the following papers are included: Some Experiments on the Excretion of Nitrogen Compounds From Legume Roots, by H. G. Myers (p. 388) (Ky. Expt. Sta.); A Study of Certain Factors Which Influence the Apparent Heat Resistance of Bacteria, by F. E. Nelson (p. 389) (Kans. Sta.); Galacturonic Acid, a Constituent of a Bacterial Gum, by C. E. Georgi, W. E. Miltzer, K. B. McCall, and D. A. Bixler (p. 390), and Utilization of Twenty-one Proprietary Peptones by Representative Aerobic and Facultative Bacteria, by M. McMaster and C. E. Georgi (p. 391), (both Univ. Nebr.); The Effect of Gramicidin and Tyrocidine on Various Bacteria, by C. M. Downs (p. 392); and Observations on the Anti-bacterial Action of Surface Active Cations, by E. I. Valko and A. S. DuBois (pp. 394-395).

Validity of the genus *Alcaligenes*, H. J. CONN. (N. Y. State Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 353-360).—On the basis of evidence presented it is pointed out that the supposed similarity of *A. faecalis* to certain soil bacteria may not actually exist. It is believed that this genus can be retained only if its type species can be recognized, which cannot now be done. At present there are five intestinal inhabitants listed under it which might well make a genus by themselves. The only soil organism now placed here is *A. radiobacter*, which is plainly out of place if the type species is the intestinal organism which requires organic N. For this, the legume bacteria, and the crown gall and related phytopathogenic and saprophytic organisms the name *Agrobacterium* n. gen. is proposed, with *A. tumefaciens* n. comb. as the type species. It is hoped that the new genus will prove a convenient place for some forms which do not fit well into any of the genera recognized in past editions of Bergey's manual (E. S. R., 81, p. 489), and that workers adding species to the genus will include only those types covered by the definition here presented.

Differentiation of the "intermediate" coli-like bacteria, R. H. VAUGHN and M. LEVINE. (Iowa State Col. and Univ. Calif.). (*Jour. Bact.*, 44 (1942), No. 4, pp. 487-505).—On statistical bases, two species of intermediate colilike bacteria were recognized under the genus *Escherichia*.

The status of *Bacillus subtilis*, including a note on the separation of precipitinogens from bacterial spores, C. LAMANNA. (Oreg. State Col.). (*Jour. Bact.*, 44 (1942), No. 5, pp. 611-617).

Studies on the luminous bacteria.—I, Nutritional requirements of some species, with special reference to methionine. II, Some observations on the anaerobic metabolism of facultatively anaerobic species, M. DOUDOROFF. (Univ. Calif.). (*Jour. Bact.*, 44 (1942), No. 4, pp. 451-459, 461-467).—*Photobacterium fischeri*, *P. splendidum*, *P. scpiac*, and *Achromobacter harveyi* were studied in these contributions. There are 25 references.

Entrance of non-motile bacteria and chemicals into water-soaked tobacco leaves, S. DIACHUN, W. D. VALLEAU, and E. M. JOHNSON. (Ky. Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 387-388).

Oxygen demand and oxygen supply, O. RAHN and G. L. RICHARDSON. (Cornell Univ.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 321-332, figs. 6).—The multiplication rate of most bacteria remains constant only for a few hours because the dissolved O₂ of the medium is soon exhausted; from then on the rate is constant only at the surface where air is available. Experiments permitted the calculation that O₂ does not penetrate deeper than 2 mm., below which facultative

anaerobes multiply more slowly while strict aerobes do not multiply at all but usually decrease. Aeration does not necessarily increase the multiplication rate, but it maintains it constant for a long time and so ensures a much larger bacterial crop. The delayed start of aerated cultures is explained by the assumption that a solution saturated with O_2 is harmful to resting cells whose enzyme mechanism is not working at the rate normal for multiplying cells. An old cell in a new environment establishes a zone of optimum conditions in its immediate vicinity, probably at the expense of reserve materials. If this is constantly disturbed the cell finally dies from exhaustion. The good growth on agar may be due to the prevention of convection currents. There are 14 references.

Pyridoxine nutrition of lactic acid bacteria, N. BOHONOS, B. L. HUTCHINGS, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 4, pp. 479-485).—*Lactobacillus casei* was shown to store pyridoxine in amounts greater than necessary for growth. Its requirement depended on the O_2 tension of the medium. Three of the six species of lactic acid bacteria studied did not require pyridoxine for growth and acid production, and they were all shown to synthesize the vitamin when cultured on a medium not containing it. The response of *L. casei* to a number of pyridoxine analogs paralleled rather closely the antidermatitic effect of these same compounds on rats.

The production of active resting cells of streptococci, A. J. WOOD and I. C. GUNSALUS. (Cornell Univ.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 333-341, figs. 5).—Resting streptococcal cell suspensions of high physiological activity, low endogenous respiration, and fair stability were produced by growth in a well-buffered medium, rich in N and accessory factors and low in carbohydrate, followed by washing in neutral phosphate buffer. Resting suspensions of cells grown under these conditions were shown to possess strong dehydrogenase activity. The cells should be harvested near the logarithmic growth phase from a medium not allowed to become more acid than pH 6.8. Methylene blue was not toxic to resting cell suspensions of group-B streptococci at 1-20,000, which (or less) is therefore satisfactory as a H acceptor in dehydrogenase studies.

Production of active and inactive catalase by *Proteus vulgaris*, T. L. SWENSON and H. HUMFELD. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 8, pp. 391-403, fig. 1).—From experimental data presented, it is believed that except during the lag phase *P. vulgaris* produces catalase throughout its growth. Two forms, active and activable, are developed, the latter capable of change to the active form by an activator. Kolmer's cholesterinized antigen, used as activator, produced approximately a fourfold increase in active catalase. When a culture was treated with O_2 up to 100 percent, concentrations up to 75 percent induced a progressive increase in catalase production, possibly attributable to the stimulating effect of O_2 on the number of viable cells. No activation occurred at 0° C. up to 60 min., but marked activities took place at 37.5° in 5 min. In explanation of this, a correlation of bacterial activity and rate of activation is suggested. Instability of the enzyme at the higher temperature was indicated by the decrease in activity after 8 min. The activable form could not be extracted by acetone and therefore may be regarded as an integral part of the living cell, i. e., a desmo enzyme. When the viable cells were destroyed, the activable catalase was either destroyed or could not be activated in the absence of viable cells. There are 57 references.

Thiamine production by *Actinomyces viridochromogenus*, J. A. HERRICK and C. J. ALEXOPOULOS (*Bul. Torrey Bot. Club*, 69 (1942), No. 8, pp. 569-572).—When this organism was grown on an alkaline liquid medium, the cultures were filtered, and the filtrate was acidified and autoclaved, it supported a heavier growth of *Stereum gausapatum* than control media not having supported the

actinomycete. Similar but more pronounced results were obtained when *Phycomyces blakesleeanus* was substituted for *Stercum*. When *P. blakesleeanus* was grown on agar plates previously inoculated with the actinomycete, *Phycomyces* produced a much denser mycelium and a crop of sporangiophores in the vicinity of the actinomycete colony. Since the growth of *P. blakesleeanus* is a recognized assay for thiamin, it is concluded that *A. viridochromogenus* produces this vitamin in culture.

Bacterial morphology as shown by the electron microscope.—III, Cell-wall and protoplasm in a strain of *Fusobacterium*, S. MUDD, K. POLEVITZKY, T. F. ANDERSON, and C. C. KAST (*Jour. Bact.*, 44 (1942), No. 3, pp. 361–366, figs. 7).—Continuing the series (E. S. R., 86, p. 200), bacteria are found to be cells with solid cell-wall and fluid or potentially fluid inner protoplasm distinct from the wall. Electron micrographs of cells of a strain of *Fusobacterium* showed striking differences in density within the protoplasm. Correlation of the significance of the differentiations observable by this technic with those seen by microchemical and staining methods is believed to present a challenging problem. There are 13 references.

A study of *Thiobacillus thiooxidans* with the electron microscope, W. W. UMBREIT and T. F. ANDERSON. (Univ. Wis. et al.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 317–320, figs. 6).—The cells were found to possess a thin cell wall differentiated from the internal protoplasm and to be differentiated morphologically and cytologically into three categories. The possible physiological interpretations of the observed structures are discussed.

Selective antibiotic action of various substances of microbial origin, S. A. WAKSMAN and H. B. WOODRUFF. (N. J. Expt. Stas.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 373–384, fig. 1).—In a comparative study of the bacteriostatic and bactericidal properties of various known substances of microbial origin, their action was compared with that of egg-white lysozyme and different common chemical disinfectants, using different test organisms and media. For example, 3–10 times as much actinomycin or streptothricin was necessary to cause the same inhibition in brain-heart-infusion agar as in nutrient agar, and inhibition by the slightly soluble products of *Bacillus brevis* was more marked in nutrient broth than in the agar media. Striking differences in selective action on bacteria were also observed. Gramicidin was most specific, acting primarily on gram-negative micrococci. Actinomycin, tyrothricin, tyrocidine, purified penicillin, gliotoxin, and the chemical detergent lauryl sulfate acted in low concentrations on gram-positive bacteria and only to a limited extent on gram-negative organisms. Pyocyanase, pyocyanin, and crude penicillin were similar in action over the whole range of test organisms used. Streptothricin was unique in being highly active against certain gram-negative bacteria and having no action against certain gram-positive organisms. On a weight basis, these microbial substances were much stronger bacteriostatic agents than the chemical antiseptics used. Marked differences were also obtained in the selective bactericidal action of the different preparations. Certain substances possessing high bacteriostatic properties were not necessarily also highly bactericidal.

Relative inhibition of microorganisms by glucose and sucrose sirups, L. TARKOW, C. R. FELLERS, and A. S. LEVINE. (Mass. Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 367–372).—The results of a study of the effects of 30, 40, and 50 percent aqueous solutions of glucose, sucrose, and mixtures of the two on *Saccharomyces cerevisiae* and *Aspergillus niger* are presented. In almost all cases the equal part mixture of both sugars yielded results intermediate between those of either sugar alone when used at the same concentration.

Cultural characteristics of *Penicillium notatum* in relation to the production of antibacterial substance: Indication of the dual nature of the antibacterial substance, W. KOCHOLATY (*Jour. Bact.*, 44 (1942), No. 4, pp. 469-477, figs. 4).—Among five strains of *P. notatum* tested, at least three—all varying widely in their production of antibacterial substance—seemed to produce two substances differing in antibacterial action. Using optimum (so far as known) conditions, a strain was found to produce an antibacterial substance which in amounts of 0.01 cc. of the crude culture filtrate added to 10 cc. of tryptose agar prevented growth of *Brucella abortus*. The Difference between purified penicillin and the substance found in the crude culture filtrate is discussed with reference to the possibility of the dual nature of the antibacterial material formed by the mold.

Nutrilite requirements of osmophilic yeasts, A. G. LOCHHEAD and G. B. LANDERKIN (*Jour. Bact.*, 44 (1942), No. 3, pp. 343-351, figs. 4).—*Zygosaccharomyces* (23 strains of 18 species) was studied with respect to requirements of inositol, biotin, pantothenic acid, thiamin, and pyridoxin, added to a basal solution of inorganic salts and 40 per cent glucose. Biotin proved essential to growth of all, and on their need for pantothenic acid they could be divided into three groups on the basis of its being essential, stimulating, or relatively unimportant. β -Alanine was able to replace pantothenic acid in providing the combined growth factor effect. Inositol was essential for optimum growth of 3 species, and in yeasts not requiring it the combined growth factor effect could be obtained with biotin and pantothenic acid. In some cases thiamin exerted slightly stimulating or depressing effects, and pyridoxin was still less important. Strains previously considered specifically identical on the basis of morphology and fermentative capacity showed good agreement in nutritive requirements, suggesting the value of the latter as a classificatory aid. There are 31 references.

John Torrey: A story of North American botany, A. D. RODGERS, III ([Princeton, N. J.]: Princeton Univ. Press; London: Oxford Univ. Press, 1942, pp. XI+352, [pls. 2]).—In the foreword, by S. W. Geiser, it is stated that "John Torrey's life in a sense epitomizes the history of botanical exploration in North America during the last century." This biography is thus a contribution to that history.

Navajo Indian medical ethnobotany, L. C. WYMAN and S. K. HARRIS (*N. Mex. Univ. Bul., Anthropol. Ser.*, 3 (1941), No. 5, pp. 76).—Material for this study consisted of over 1,200 plant specimens belonging to 80 families, 286 genera, and 515 species. Each specimen was named and its medicinal uses explained by 1-4 informants. Only plants used in medicine were collected, since others have published lists of plants used for food, dyes, or other economic purposes. The data were obtained by going into the field accompanied by an informant and (where necessary) an interpreter, and recording the names and uses of each specimen. The Navajo plant classification system is discussed in some detail, and the three main parts of the publication comprise, respectively, the Navajo name list, the botanical list, and the uses of the plants considered.

Taxonomy and phylogeny, I-III, W. B. TURRILL (*Bot. Rev.*, 8 (1942), Nos. 4, pp. 247-270; 8, pp. 473-532; 10, pp. 655-707).—In this monographic review the author is concerned mainly with the results of botanical studies, with stress on "the general problems of taxonomy and of phylogeny and the actual, supposed, and possible relationships between them." Emphasis is given to such subjects as seem in need of more study or the critical consideration of which might well lead to marked improvement in taxonomy or advance in knowledge of phylogeny or both.

Part 1 is introductory, presenting the scope of the paper, derivations and definitions of terms, and data on the historical development of plant classification. Part 2 considers the taxonomic and phylogenetic concepts and criteria, and data used in classification and phylogenetic studies. Part 3 takes up the classification and phylogeny in the major plant groups from bacteria through monocotyledons. Supplemental matter includes "logical" as opposed to "phylogenetic" classification, phylogenetic diagrams, and general conclusions. "The task of the systematist is twofold: To prepare as many special classifications as are needed for special biological investigations or to make available materials for others to construct such special classifications, and to make a general classification which shall express as far as possible in rational order all that is known concerning plants and animals. This last . . . is an ideal greater than the phylogenetic ideal which is included in it and one which in the process of attempted attainment must make taxonomy what it should be, the focal point of biology." There are 509 references.

The botanical, erosion control, and economic significance of white poplar in Maryland, S. GROBER (*Md. Univ. Off. Pub.*, 39 (1942), No. 13, pp. 17-18).—An abstract.

Cornus sericea L. (C. stolonifera Michx.), F. R. FOSBERG. (U. S. D. A.) (*Bul. Torrey Bot. Club*, 69 (1942), No. 8, pp. 583-589).—A taxonomic study of forms centering around this species of dogwood.

Trends in the development of geographic botany, H. M. RAUP (*Ann. Assoc. Amer. Geog.*, 32 (1942), No. 4, pp. 319-354).—This paper is concerned not so much with the details of methods as with some trends in what might be called the logical approach to plant geography. The discussions are grouped around the following: Theophrastus to Humboldt—floristic plant geography, Humboldt to Darwin, current trends, the development of geography as a whole, and the nature of plant geography. There are about four pages of references.

The plant communities of the Welaka area, with special reference to correlations between soils and vegetational succession, A. M. LAESSLE (*Fla. Univ. Pub., Biol. Sci. Ser.*, 4 (1942), No. 1, pp. 143, pls. 14, figs. 29).—This monographic ecological contribution was made on the University of Florida Conservation Reserve (2,180 acres) in Putnam County. The study involved some 750 plant species. There are nearly two pages of references.

Biochemical nitrogen fixation studies.—IV, Experiments with excised legume nodules, F. E. ALLISON, S. R. HOOVER, and F. W. MINOR. (U. S. D. A.). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 63-71).—In further studies of this series (E. S. R., 85, p. 317), using cultures of nodules from sweetclover, cowpea, crown vetch, soybean, and hairy vetch with N fixation determined by three methods, no fixation was observed with whole or crushed nodules in Warburg vessels at 28° C. in various gas mixtures and in a mineral-culture solution containing sucrose, glucose, or mannite. A 1-3 percent increase in N was noted in a few cases where nodules were kept in thin layers of a mannite-glucose medium at 4°-12° for 1-3 days. Pure *Rhizobium* cultures failed to fix N when supplied with oxalacetic acid, and a few tests with excised nodules gave negative or inconclusive results. Furthermore, in 15 series of tests in which many variables were considered, there was no evidence that juices extracted from nodules and sterilized by filter candle passage could fix atmospheric N when incubated in mineral-sugar solutions. There are 15 references.

Effects of growth substances on reserve starch, S. C. BAUSOR (*Bot. Gaz.*, 104 (1942), No. 1, pp. 115-121, figs. 8).—Indoleacetic or β -naphthoxyacetic acids in lanolin induced starch depletion in tomato cuttings kept 6 days in darkness in a mineral nutrient containing sucrose; controls still had an abundance. In

media containing maltose, levulose, dextrose, or lactose in place of sucrose, cuttings responded in the same way to the acids, and N-deficient plants also showed starch depletion under similar treatment. Starch was deposited in the root caps of primordia which resulted from treatment. Starch digestion was inhibited in thin sections by aqueous solutions of 0.02 or 0.002 percent indoleacetic acid; in controls starch depletion occurred rapidly. Lower acid concentrations were ineffective. On the other hand, in intact stems 0.02 percent indoleacetic acid in aqueous solution accelerated starch hydrolysis.

The extraction of auxin from plant tissues, II, K. V. THIMANN, F. SKOOG, and A. C. BYER (*Amer. Jour. Bot.*, 29 (1942), No. 8, pp. 598-606, figs. 4).—Continuing the series (E. S. R., 85, p. 26), the yield of auxin from *Lemna* and from tobacco leaves was greatly increased by short incubation with chymotrypsin or trypsin, and ficin had a similar but smaller effect. Though yield was greatly decreased by boiling, treatment with proteolytic enzymes raised the yield to that of unboiled material. It is concluded that auxin in green material is bound to protein or a proteinlike substance, and that the effect of boiling is in the main to destroy the enzyme system that liberates it. Prolonged incubation of plant material to allow autogenous enzymes to act is not a practicable method of extraction because of auxin production by bacteria which cannot be completely overcome by adding bactericides. The disadvantages of other methods with various plants are discussed, and suggestions are presented for a simplified procedure which is said to determine the bulk of the total auxin in green plant material with a minimum number of extractions.

Total auxin extraction from wheat, G. S. AVERY, JR., J. BERGER, and B. SHALUCHA (*Amer. Jour. Bot.*, 29 (1942), No. 8, pp. 612-616).—Total auxin yields from high and low protein wheats were about the same whether samples were extracted for 45 hr. at 22° C. or for 15 min. at 120°. The highest yields were obtained when extractions were made at pH 9.3-10.5, and lower ones at pH 4, 7, and 11.5 (but more at 11.5 than at 7). Marked auxin destruction from 5 or 6 samples tested occurred on 15-min. autoclaving with 1.0 N NaOH, in contrast to the alkali-stable auxin in corn kernels; thus 70 percent or more of the total auxin is a compound other than indoleacetic acid. Auxin yields were apparently unrelated to protein content. Auxin yields from wheat samples of different protein content differed in size as much as fourfold. The probable presence was established of two precursors which are converted into two auxins on hydrolysis at pH 10.5; they differed markedly in stability in presence of alkali.

Biochemistry of salt absorption and accumulation by plants with special reference to the role of ether soluble organic acids, E. C. PIERCE (*Md. Univ. Off. Pub.*, 39 (1942), No. 13, pp. 19-20).—An abstract.

Effects of platinum chloride on bean and tomato, C. L. HAMNER (U. S. D. A.). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 161-166, figs. 2).—Beans grown in sand at concentrations of 15^{-5} , 9^{-5} , 3^{-5} $H_2PtCl_6 \cdot H_2O$ were inhibited in growth, had smaller leaf area, higher osmotic pressure, and a lower transpiration rate, resisted wilting much longer than controls, and were also less succulent. Beans grown in sand in the dark at concentrations of 15^{-5} , 9^{-5} , 3^{-5} were inhibited in stem and hypocotyl elongation. Those grown in soil to which a 15^{-5} concentration was added failed to show any response. Tomatoes grown in sand at concentrations of 15^{-5} , 9^{-5} , and 3^{-5} were inhibited in growth, had chlorotic lower leaves, and resisted wilting longer than controls. When the cut ends of severed bean or tomato plants were placed in dilute concentration they soon showed symptoms of toxicity and were killed.

Volatile sulphur content of black mustard plants, S. V. EATON (*Bot. Gaz.*, 104 (1942), No. 1, pp. 82-89).—*Brassica nigra* leaves contained more volatile S

than the stems; results on roots were inconclusive. The leaves contained more when the plants had been grown in sand with a complete nutrient solution than in soil. S and N are both components of allyl mustard oil. Growing plants in a minus-S nutrient solution caused an almost complete loss of pungency of the leaves. Minus-N leaves were somewhat more pungent than plus-N leaves. Young leaves contained more volatile S than older ones. More pungent were the upper leaves than the lower, and the leaves of plants grown for a short time than those of plants grown a longer time. Tissues of high water content contained less volatile S than those of lower water content. There are 16 references.

Effect of nutritional levels on the elaboration of rotenone, R. H. MOORE (P. R. Expt. Sta.). (*Rev. Agr., Indus. y Com., Puerto Rico*, 34 (1942), No. 1, pp. 111-113).—The results of the experiment reported indicate that derris, unlike sugarcane, develops its highest commercial value when growing vigorously, which means that the formation of rotenone and total extractives is favored by ample water and fertilizer.

The response of *Achras zapota* in latex yield to wounding by the ibidem method of tapping, J. S. KÄBLING (*Bul. Torrey Bot. Club*, 69 (1942), No. 8, pp. 553-560, figs. 4).—Tapping tests with *A. zapota* (principal source of chicle) in British Honduras involving application of the method ("ibidem") commonly used on *Hevea brasiliensis* indicated a lack of response to the stimulus of wounding. The initial oblique incisions in the cortex drained the latex from an area about 10-14 in. above and below, and daily parings of the lower margin of the incisions within such areas yielded no additional latex. These results indicate that this species cannot be tapped profitably by this method, and that successive incisions in the cortex must be spaced about 14-16 in. apart to secure the maximum yield per tapping. There are 19 references.

The effects of l-proline on proliferation of cells and differentiation of protoxylem in roots of cotton and bean, E. S. BARGHOORN, JR. (*Growth*, 6 (1942), No. 1, pp. 23-31).—In cultured cotton seedlings and excised bean root tips, 5/100,000 M and 2/100,000 M concentrations of proline tended to retard root growth in length, whereas 1/100,000 M. had no apparent influence. There was some evidence that this retarding effect is roughly proportional to the molecular concentration of proline in solution. No clear-cut evidence was obtained to show a specific effect of proline on the rate of protoxylem differentiation. Possible traumatic effects in excised roots must be considered in any conclusions drawn from such material.

Susceptibility of *Colchicum* and *Chlamydomonas* to colchicine, I. CORNMAN (*Bot. Gaz.*, 104 (1942), No. 1, pp. 50-62, figs. 8).—Excised *Colchicum* roots cultured in small vials proved immune to 1 percent colchicine. Mitosis in excised roots of *C. byzantium* was partly disrupted by 2.5 and entirely blocked by 5 percent colchicine, and in *C. autumnale* it was first disrupted and finally completely blocked by 10 percent. It is concluded that immunity results from an extramitotic protection, not from a difference in the mitotic mechanism. As judged by the reproduction rate, *Chlamydomonas pseudococcus* was resistant to both colchicine and acenaphthene. This immunity was not specific for colchicine and may represent the type of resistance in organisms not naturally containing it. There are 27 references.

Plant tissue cultures, P. R. WHITE (In *Annual Review of Biochemistry*, XI, edited by J. M. LUCK and J. H. C. SMITH. (Stanford University, Calif.: Ann. Rev., Inc., 1942, vol. 11, pp. 615-628).—A critical review with 129 references.

Device for measuring entry of water into roots, H. E. HAYWARD, W. M. BLAIR, and P. E. SKALING. (*U. S. D. A. et al.*). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 152-160, figs. 11).—A potometric device for quantitative determination of water

movement in roots is described and illustrated which can be attached to any part of a root. Tests with young corn roots indicated that the rate of entry increases from the zone proximal to the root cap to a point 10 cm. from the root tip. In most cases the rate decreased above this level in roots over 10 cm. long. Lateral entry into older parts of citrus roots proved measurable, and they probably provide the major avenue of entrance during some seasons of the year. The root lenticels may be structures through which water most readily enters older parts of the root.

Water uptake by excised root systems of the tomato due to non-osmotic forces, J. VAN OVERBEEK (*Amer. Jour. Bot.*, 29 (1942), No. 8, pp. 677-683, figs. 6).—The osmotic pressure of the exudate of decapitated plants grown in culture solution was considerably lower than that with which the roots absorbed water. The latter pressure (root pressure) was determined as the osmotic pressure of a mannitol solution placed around the roots which reduced the exudation rate exactly to zero. It is concluded that the pressure with which healthy root systems of decapitated tomato plants absorb water is made up of two components—an "active" pressure and a pressure of osmotic origin. Roots kept in distilled water during the test developed an average root pressure of 1.4 atmospheres, of which 71 percent was active pressure and 29 percent pressure of osmotic origin. Roots kept in Hoagland solution during the test absorbed water with an average pressure of 2.68 atmospheres, 48 percent of which was active. The active component of the root pressure could be reversibly eliminated by KCN.

Chloroplast substance of spinach leaves, C. L. COMAR (*Ind. Expt. Sta.*). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 122-127).—Preparations of chloroplast substance isolated by fractional centrifugation exhibited less protein contamination than by the methods of flocculation by CaCl_2 or freezing. The chloroplast substance of spinach leaves contained about 54 percent protein, 34 percent lipid, 5 percent chlorophyll, and 7 percent ash. About 11 percent of the total N was accounted for by chlorophyll. There are 19 references.

Effect of light quality on growth and mineral nutrition of bean, L. M. RORERBAUGH (*Bot. Gaz.*, 104 (1942), No. 1, pp. 133-151, figs. 9).—Using equal amounts of incident energy, the lengths of red kidney bean hypocotyls and first internodes were least in plants receiving light from nearly all parts of the visible spectrum and light from daylight and blue tubes produced very little differences in the plants. Considering only the plants grown under lamps and filters emitting light from rather narrow regions of the spectrum, the effectiveness in inhibiting elongation was greatest in the red and least in the blue regions, and the average leaf area was least in the green and slightly greater in the red than in the blue. Average leaf area and dry weight production were greatest with more balanced radiation. Visible flower buds developed earlier in green than in other light, but many of these buds abscised. No significant differences in total ash or in amount of K or Mg therein were found under the different lamps. The amount of Ca in the leaves was closely correlated with dry weight and was highest with radiation from most of the visible spectrum and lower when narrower regions were used. High Ca content of the leaves was correlated with low Ca content of the stems, and vice versa. The amounts of P in plants under the more balanced light of daylight and pink and blue tubes without filters were almost equal. It was higher in plants receiving no radiation in the blue and in those receiving none from the red end of the spectrum, and still higher when light from both ends was absent. There are 28 references.

Effects of photoperiod on microsporogenesis in Biloxi soybean, C. S. NIELSEN (*Bot. Gaz.*, 104 (1942), No. 1, pp. 99-106, figs. 19).—In three experimental series, photoinductive treatments of 2-10 cycles were given consisting of 8 hr. of natural daylight followed by 16 hr. of darkness, after which series 1 and 2 were placed on cycles of long photoperiod (21 hr. light and 3 hr. darkness) and series 3 on cycles of 16 hr. light and 8 hr. darkness. Of the three control types, one group was kept on long photoperiod, none flowering; the other two groups, kept on natural and short photoperiods, respectively, both flowered. In the second and third control groups floral development was normal and meiosis was as described by previous workers. In all the experimental groups the floral structures developed normally until sporocyte differentiation in the anthers had occurred, following which various meiotic abnormalities were observed. With 5 or fewer photoinductive cycles the sporocytes might begin to enlarge, accompanied by marked vacuolization of the cytoplasm and final disintegration of nuclei, and only a few sporocytes attained metaphase in meiosis I. With 6 or more photoinductive cycles of short photoperiod microsporocyte degeneration in some anthers occurred, but in others meiosis was apparently normal and four groups of chromosomes were formed. In some cases degenerative changes occurred at this point before cleavage into microspores, in others cleavage was followed by degeneration before the development of normal microspores, whereas in a very small proportion of cases apparently normal microspores were formed. With even as many as 10 photoinductive cycles of short photoperiod, a high percentage of degenerated microspores were observed. The long postinductive photoperiod used appeared to have played a significant role in inducing the degenerative changes found and in suppressing mature-flower development.

An analysis of the wood of the three commercial species of white pine, E. B. MATZKE and R. L. HULBARY (*Bul. Torrey Bot. Club*, 69 (1942), No. 8, pp. 573-582, figs. 5).—In the course of work on lumber, it became necessary to distinguish microscopically between the wood of three species of pine. The pits of the ray parenchyma cells in contact with the tracheids proved to be large and oblong in *Pinus strobus*, somewhat smaller and lemon-shaped in *P. lambertiana*, and intermediate in *P. monticola*. In ray parenchyma pit characters the last species is a little closer to *P. lambertiana* than to *P. strobus*, but in other features, gross and microscopic, *P. monticola* also is intermediate between the other two. The series thus formed on the basis of wood characters coincides with that appearing in the manuals and conforms to the distribution of these three species in nature, though other species undoubtedly also belong in this series.

Development of the gametophytes and fertilization in Camassia, F. H. SMITH. (*Oreg. State Col.*). (*Amer. Jour. Bot.*, 29 (1942), No. 8, pp. 657-663, figs. 30).—This paper was prepared to give more extensive descriptions of the development of the gametophytes and of the fertilization processes in *Camassia* and to recommend its use in the classroom in place of *Lilium* to demonstrate the development of the angiosperm gametophyte.

Microsporogenesis and development of seed in Lobelia cardinalis, G. O. COOPER. (*Univ. Wis.*). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 72-81, figs. 40).

Development of the macrogametophyte of Miersia chilensis, M. S. CAVE. (*Univ. Calif.*). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 185-187, figs. 10).

Development of the node in Ricinus communis, M. E. REYNOLDS. (*Univ. Calif.*). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 167-170, figs. 9).

Development of the pistillate flower and structure of the fruit of tung (Aleurites fordii), L. P. McCANN. (*U. S. D. A.*). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 8, pp. 361-378, pls. 4, figs. 4).—This study was undertaken to

determine the general morphological and developmental characteristics of the fruit, many particulars of which were hitherto unknown. This information is particularly important as a basis for further studies of the origin of the oil and the nature of its elaboration, and details of the results obtained are presented. The species is commonly monoecious and predominantly synoecious, but trees producing preponderantly staminate or pistillate inflorescences are not uncommon. Pistillate flowers are initiated from late May to late October, and development of the inflorescence is basipetal but that of the individual flowers is acropetal. From setting to maturity, growth of the fruit can be divided into two major periods: (1) Growth in size of structural elements of hulls and seed coats and (2) structural and physiological filling of seeds by growth of endosperm and embryo, the latter initiated about the time maximum size of fruit is attained. Tung fruit is morphologically distinct and not readily allocated to any specific conventional classification such as dry drupe or capsule. There are 29 references.

GENETICS

Wheat phylesis and wheat breeding from a cytogenetic point of view (cytogenetic indices for the rôle of interspecific hybridization in the origin of wheat species and for applying interspecific hybridization in producing valuable wheat forms), D. KOSTOFF (In *Bibliographia Genetica*. 's Gravenhage (The Hague): Martinus Nijhoff, 1941, vol. 13, No. 2, pp. 149-224, figs. [7]).—In this monograph the genus *Triticum* and allied genera are dealt with, but the principles outlined are said to be successfully applicable to other genera. All wheat species from tetraploid and hexaploid groups studied were found to have originated by chromosome doubling in species hybrids, i. e., they are all allopolyploid species. Cytogenetic investigations show that plant breeding work cannot be successfully carried out when interspecific and intergeneric hybridization is employed without knowledge of the phylogeny of the species and genera crossed, hence cytogenetic and phylogenetic investigations are solid bases on which such breeding work may rest. Knowing the cytogenetic behavior of the F_1 species hybrids, the behavior of their amphidiploids and some other polyploid forms may in many respects be predicted. There are nine pages of references.

Awn inheritance in barley, J. L. MYLER. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 9, pp. 405-412, fig. 1).—Awn inheritance in Atlas \times Awnless was found due to the factors Lk_1k_1 and Lk_2k_2 ; long-awned plants carry both dominants, short-awned plants have Lk_1 dominant and Lk_2 recessive, and awnletted plants have Lk_1 recessive and Lk_2 dominant, while plants carrying both recessives are awnless. This two-factor explanation also held true in Black Hull-less \times Awnless and C. I. No. 5628 \times Awnless. In the two-rowed, long-awned, Redrachis \times Awnless a two-factor difference with a 15:1 ratio was shown. In Nepal \times Awnless the varieties differed by three factors for awn development. Nepal carries Lk_1Lk_2 and Lk_3Lk_4 and KK for hood development. Awnless carries the three recessives. Development of hooded plants requires the presence of both dominant awn factors and the hood factor. KK , in a few cases, tends to flatten and to cause a bend or twist near the end of the short awns, and also tends to cause a minute fork at the tip of the awnlet of a few central spikelets in awnletted segregates.

The problem of haploidy (cytogenetic studies on *Nicotiana* haploids and their bearings to some other cytogenetic problems), D. KOSTOFF (In *Bibliographia Genetica*. 's Gravenhage (The Hague): Martinus Nijhoff, 1941, vol. 13, No. 1, pp. 148, figs. 40).—In this monograph, haploid *N. langsdorffii*, *N. sylvestris*, *N. rustica*, and *N. triplex* as well as haploids of the type of F_1 hybrids from the

amphidiploids *N. rustica-paniculata*, *N. sylvestris-tomentosiformis*, and *N. glauclangsdorff* are described. The bibliography covers nearly 14 pages, and an author-subject index is provided.

Asynaptic Gossypium plants and their polyploids, J. O. BEASLEY and M. S. BROWN. (Tex. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 9, pp. 421-427, figs. 3).—An F_2 progeny of American upland (*G. hirsutum*) \times sea-island (*G. barbadense*) cotton included sterile asynaptic plants in a ratio of 15 fertile:1 sterile. The fertile plants at first metaphase had the normal 26 pairs of chromosomes, while asynaptic plants averaged from 6 to 12 pairs. Doubling chromosome number by colchicine treatment of grafts of sterile asynaptic plants failed to restore normal chromosome pairing and fertility.

Chromosome degeneration in relation to growth and hybrid vigor, D. F. JONES. (Conn. [New Haven] Expt. Sta.). (*Natl. Acad. Sci. Proc.*, 28 (1942), No. 2, pp. 38-44).—This is a discussion of underlying principles and theoretical aspects.

Studies on the cytology of Vaccinium species, G. M. DARROW, W. H. CAMP, H. E. FISCHER, and H. DERMEN. (U. S. D. A. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 187-188).—Information is presented on the chromosome complements of a large number of blueberry seedlings. In general, the tetraploid species were taller and more vigorous, had larger leaves, flowers, and berries, and suckered less freely than diploids. No triploids were discovered. A vigorous pentaploid, similar to *V. amoenum*, was collected in the wild in southeastern Georgia. Pentaploids were easily produced by crossing the tetraploid *V. australe* with the hexaploid *V. ashel*. Apparently species with the same number of chromosomes hybridize easily in nature.

Colchicine induced univalents in diploid Antirrhinum majus L., A. H. SPARROW (*Science*, 96 (1942), No. 2494, pp. 363-364).

Colchicine-induced tetraploidy in Oenothera, A. HECHT (*Ind. Acad. Sci. Proc.*, 51 (1941), pp. 87-93, figs. 8).—Tetraploids were obtained on about 14 races and hybrids following colchicine treatment of the germinating seeds. They differed from the diploids in general enlargement of all parts and in several other characters peculiar to the individual species. Whereas pollen grains from diploid *Oenothera* are three-lobed, many of those from corresponding tetraploids were at least four-lobed. If the diploid configuration is a circle of four chromosomes that of the tetraploid tends to be a circle of eight, but not all cells form circles as large as this. The bivalents tend to become tetravalents, but some of the associations of four fail to do so. The evolutionary significance of polyploidy in *Oenothera* is briefly discussed.

Breeding new tetraploid grape varieties, H. P. OLMO. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 225-227).—A study of various tetraploid grapes showed that most of these varieties have certain defects, such as poor growth, irregular setting of fruit, and low yields. Because of the inconsistent behavior of tetraploids, some being satisfactory and others not, the author concludes that it is impossible to predict the effects of doubling the chromosomes of a given variety. The particular genotype of the original variety appears to determine the behavior of the new tetraploids more than the simple doubling of the chromosomes. Crosses between the tetraploid Muscat of Alexandria and a tetraploid Sultanina yielded three seedlings, two of which were pentaploid and one triploid. A later cross of the same two tetraploids yielded 10 tetraploids with a range in chromosomes of 76 to 76 ± 4 , and with material differences in growth habit and fertility.

[Genetic studies with violets by the Vermont Station]. (*Vermont Sta. Bul.* 495 (1942), pp. 27-28).—Progress reports are presented on studies by A.

Gershoy of polyploidy in violets, fertility relations among violet species, effect of colchicine treatments, and pollen tube development in the violet.

Breeding and improvement of farm animals, V. A. RICE (*New York and London: McGraw-Hill Book Co., 1942, 3. ed., pp. XX-750, figs. 213*).—This book (E. S. R., 72, p. 311) has been enlarged and revised into four sections. In section 1 the present status of animal breeding is given with the origin of both man and animals and the broader aspects of the evolutionary process. Section 2 deals with the mechanisms of reproduction in animals from the theoretical and practical standpoint, with the addition of chapters on the endocrine basis of reproduction and lactation and artificial insemination, by F. N. Andrews. Section 3 is devoted to the mechanisms of heredity and brings into use genetic principles. In section 4 the application of genetic principles to practice in the breeding of livestock is described.

Hydrocephalus, a lethal in cattle, C. L. COLE and L. A. MOORE. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 65 (1942), No. 10, pp. 483-491, figs. 5*).—Among 27 calves produced in matings of their sire to his daughters there were 5 lethals manifesting an internal hydrocephalus and several cases of asymmetry. Abnormalities of the skull and malformations of the humeri and femurs of the lethal animals were also noted. In this group there were 2 with a marked lack of muscular coordination and control. The three conditions are thought to be recessive and nonlinked. The probability that a single sire would carry the three rare genes seems very small.

[**Breeding and cross-breeding studies with chickens and turkeys by the North Carolina Station**] (*North Carolina Sta. Rpt. 1941, pp. 56-58, figs. 3*).—Results are briefly given on the development of Barred Plymouth Rocks and Rhode Island Reds of superior growing and breeding quality; superiority of crossbreds between the several breeds and purebreds of the Barred Plymouth Rock, New Hampshire, and White Leghorn for egg and broiler production; and improvement of turkey families for laying and viability.

Breeding Rhode Island Reds for rapid feathering, F. A. HAYS and R. SANBORN (*Massachusetts Sta. Bul. 396 (1942), pp. 24, pls. 6*).—Over 30,000 chicks bred in three lines in 10 generations were examined at 8 weeks of age as follows: (1) Complete back feathering at 8 weeks; (2) absence of back feathering at 8 weeks; and (3) control line selected for high fecundity regardless of rate of feathering. There appeared to be an important relationship between the recessive sex-linked gene *sl* for rapid feathering and the development of tail feathers at 12 days of age and the degree of feathering over the back at 8 weeks of age. A dominant autosomal gene *X* seemed to exert a cumulative effect with *sl* to produce complete feathering over the back at 8 weeks of age, and essentially eliminated sex-dimorphism in the rate of feathering in the rapid feathering stock of Rhode Island Reds selected for several generations. No relation was found between the rate of feathering and egg production. In nine feather tracts, it was noted that head, leg, and abdomen were slowest to complete feather development. The most rapid feathering occurred in the shoulder and thigh regions in which feather development was completed at rather early ages. The relation of tail feathering at 12 days and back feathering at 8 weeks was ascertained for birds of the different genotypes. Illustrations are presented to show the feathering of chicks of different genotypes at 12 days and 4 and 8 weeks of age.

Hereditary chondrodystrophy in the fowl, W. F. LAMOREUX. (Cornell Univ.). (*Jour. Hered., 33 (1942), No. 8, pp. 275-283, figs. 4*).—Among 1,713 chicks from heterozygous parents there occurred 22.5 percent chondrodystrophic progeny which seemed little affected by the change of seasons. The condition behaved as a simple autosomal recessive factor, with the symbol *ch* suggested. Sex

did not seem to cause a significant difference in the occurrence of chondrodystrophy. In its expression it ranged from normal to birds with short curved beaks and shortened and bent tibiae and tarso-metatarsi. The viability was low. The occurrence of the condition was attributed to descendants of a single ♂.

Form and function in Frizzle fowl: The interaction of hereditary potentialities and environmental temperature, W. LANDAUER. ([Conn.] Storrs Expt. Sta.). (In *Biological Symposia*, VI, edited by J. CATTELL. Lancaster, Pa.: Jacques Cattell Press, 1942, vol. 6, pp. 127-166, figs. 27).—The reactions of the Frizzle fowl to temperature variations are presented much as in a previous publication (E. S. R., 75, p. 764).

On the lopping of combs in White Leghorn females, C. D. MUELLER and F. B. HURT. (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 430-436, fig. 1).—In four strains of Single-Comb White Leghorns, involving 6,625 pullets having lopped combs, 73 percent showed a tendency to lop to the right, but there was no relation to age, body weight, viability, or number of eggs laid to 500 days. Although differences were shown in different years, 5.3 percent having erect combs tended to be inferior to their lopped-comb sisters.

The developmental mechanics or hereditary abnormalities in the chick, V. HAMBURGER (In *Biological Symposia*, VI, edited by J. CATTELL. Lancaster, Pa.: Jacques Cattell Press, 1942, vol. 6, pp. 311-336, pls. 2, figs. 4).—Embryonic development of the creeper fowl (E. S. R., 85, p. 605) is described for homozygous creepers which die on the third or fourth day of incubation, homozygous creepers which survive, and heterozygotes. Limb transplantations were made between these classes and with normals. All from the heterozygous embryos showed symptoms characteristic of chondrodystrophy. Transplants from homozygous donors developed all characteristics of phocomelia, and some were viable. In creepers there was shown to be an effect on early yolk sac circulation, disturbance of ossification, and eye abnormalities, resulting from disturbances of the head mesoderm and effects on growth. The creeper gene was complex and needed the combined interpretation of the geneticist, embryologist, and physiologist.

Further progress with artificial selection, H. D. GOODALE (*Amer. Nat.*, 76 (1942), No. 766, pp. 515-519).—The author describes progress made in the development of four stocks of mice with different amounts of white. All were descended from five foundation animals previously noted (E. S. R., 78, p. 610). One stock was characterized by a few white hairs and continued by random breeding. In another stock the few white hairs were eliminated. The third and fourth stocks were selected for total white, but no progress seemed to have been made for the appearance of white in exact locations. Under wild conditions these stocks might constitute new species or subspecies.

An aberrant ratio in *Peromyscus*, R. R. HUERTIS and V. PIESTRAK (*Jour. Hered.*, 33 (1942), No. 8, pp. 289-291).—Significant deviations in the ratios of silver flexed tail mice occurred in the F_2 of crosses involving these genes with the normal. The situation was considered to result from differential viability with some overlapping of the flexed tail class with wild type and linkage between silver and flexed tail genes. In the χ^2 test P was less than 0.001. The greatest deviation was 1 in the double recessive class when 67 were expected among over 1,000 F_2 s.

The physiological genetics of coat color of the guinea pig, S. WRIGHT (In *Biological Symposia*, VI, edited by J. CATTELL. Lancaster, Pa.: Jacques Cattell Press, 1942, vol. 6, pp. 337-355, figs. 3).—There seems no logical limit to the degree of complexity of organization which may arise in an orderly way in the embryo of a largely contained system. An example showing this is taken from the color factors in the guinea pig (E. S. R., 76, p. 775).

A case of parallel embryonic development in the rat and its bearing on the question of superfetation, C. K. WEICHERT (*Anat. Rec.*, 83 (1942), No. 4, pp. 511-519, pl. 1).—There is described the parallel development of two sets of embryos in a ♀ rat suckling nine young and inseminated during the post-partum oestrus. Only one ovulation had occurred, but the embryos were 4.5 days apart.

Studies on experimental teat and mammary development and lactation in the goat, S. J. FOLLEY, H. M. S. WATSON, and A. C. BOTTOMLEY (*Jour. Dairy Res.* [London], 12 (1941), No. 3, pp. 241-264, pl. 1, figs. 12).—Teat growth in five castrated and three normal goats was shown to be isometric relative to the general body growth, thus indicating that the testes were not responsible for maintaining isometric growth of the teats as in the guinea pig (*E. S. R.*, 80, p. 753). Oestrogen administration either from the natural or synthetic material caused the teats to grow allometrically even at 41 days of age in virgin ♀s. Teat growth ceased during rutting. Application of diethylstilboestrol or its dipropionate by inunction caused an increase in udder growth and artificial lactation. Photomicrographs of the mammary glands are presented.

Mammogen and unilateral mammary gland growth in the rabbit, A. A. LEWIS and C. W. TURNER (*Mo. Expt. Sta.*). (*Endocrinology*, 30 (1942), No. 6, pp. 985-989).—Percutaneous treatment with oestrone dissolved in olive oil of mammary glands and teats of ♂ rabbits after shaving the hair showed that oestrogen seemed to possess characteristics and properties not present in skin irritants such as turpentine. It was noted, however, that these irritants caused local subcutaneous hyperemia.

Studies concerning the mechanism controlling the initiation of lactation at parturition, I-IV, J. MEITES and C. W. TURNER (*Mo. Expt. Sta.*). (*Endocrinology*, 30 (1942), No. 5, pp. 711-733, fig. 1; 31 (1942), No. 3, pp. 340-344, fig. 1).—Four studies in this series are presented.

I. Can estrogen suppress the lactogenic hormone of the pituitary? (pp. 711-718).—The amounts of lactogenic hormone in the pituitary of lactating rats were not decreased by the daily administration of 2 mg. of diethylstilboestrol or testosterone propionate for 6 days, although 38 and 11 percent, respectively, of the young died during the first week after birth. The lactogen content of the pituitaries of ♂ guinea pigs was increased in spite of the administration of 100 mg. of diethylstilboestrol per day for 10 days. Decreases in milk production are thought due to a decrease in the other pituitary hormones.

II. Why lactation is not initiated during pregnancy (pp. 719-725).—Study of the lactogen content of the pituitaries of immature ♀ guinea pigs showed that 5 days' administration of 25-200 I. U. of oestrone caused increases of 11-112 percent in the lactogen production. No increase was produced by progesterone alone or with oestrone, and there was indication of inhibition in lactogen production. Progesterone is considered to explain the failure of lactation during pregnancy.

III. Can estrogen account for the precipitous increase in the lactogen content of the pituitary following parturition? (pp. 726-733).—The subcutaneous injection of ♂ guinea pigs with 0.3 mg. of oestrone over periods of 1-30 days showed that oestrogen was capable of exerting a remarkably quick stimulus on lactogen production of the pituitary. This mechanism is considered responsible for milk secretion in the rat, guinea pig, and rabbit 2-5 days post partum. The study was carried out with 40 ♂ guinea pigs, divided in groups of 5 each, receiving the same total amounts of oestrone over different periods. The increases after 10 days were not significant. Studies with 4 rabbits showed that there was an increase in the lactogen content of the pituitary 5 days after hysterectomy on the twentieth

day of gestation, further supporting the role of progesterone inhibiting the lactogen production by the pituitary.

IV. *Influence of suckling on lactogen content of pituitary of postpartum rabbits* (pp. 340-344).—The act of nursing in the rabbit seemed to stimulate milk secretion and the lactogen content of the pituitary. The study was conducted with 72 New Zealand White rabbits, one half of which were allowed to suckle their litters after birth, and the litters of the others were removed immediately. Considerably more secretion was found in the mammary glands of rabbits allowed to suckle their young than was present in does from which the young were removed at birth.

Lactogenic hormone content of anterior pituitary gland of albino mouse as compared to other species, V. HURST and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 31 (1942), No. 3, pp. 334-339, figs. 2).—The lactogen content of the pituitary glands of ♀ mice assayed in pigeons was relatively low in the virgin animal, but increased 88 percent by the tenth day of pregnancy with an additional 63 percent after parturition. By the fifth day post partum the peak lactogen content was reached, with a decline thereafter. The curve for lactogen content of the pituitary followed in general the results from other species. The pituitary lactogen content per unit weight was not altered by ovariectomy or thyroxin injections administered alone.

Selection of nipples by suckling rats and its effect upon mammary system, C. K. WEICHERT (*Endocrinology*, 31 (1942), No. 3, pp. 349-353, figs. 3).—Observations on suckling in 67 lactating rats with litters of 1-6 showed a tendency to select the nipples in the anterior-posterior sequence, with the smaller litters confining themselves to the anterior pectoral region. Mammary tissue of neglected nipples retrogressed.

Progesterone-like activity of some steroid compounds and of diethylstilbestrol in stimulating mammary lobule-alveolar growth, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 30 (1942), No. 5, pp. 706-710, fig. 1).—The lobule-alveolar responses of ovariectomized virgin mice, using progesterone as a standard according to the technique recently developed (E. S. R., 86, p. 671), showed that when injected with oestrone pregnenolone had an activity of approximately one-half, desoxycorticosterone acetate and dehydroandrosterone of one-third, diethylstilbestrol of one-fourth, acetoxypregnenolone of one-sixteenth, and methyl testosterone of one twenty-fifth that of progesterone. Testosterone and testosterone propionate failed to stimulate lobule-alveolar growth when administered in doses of 10 mg. There were employed for each dose level from 2 to 12 animals.

Influence of thyroxine upon mammary lobule-alveolar growth, J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 31 (1942), No. 3, pp. 345-348).—The percentage of castrate ♀ mice responding with lobule alveolar growth to progesterone and oestrone administration was significantly increased with optimum doses of thyroxin. On the other hand, thyroidectomy inhibited these responses.

Effects of purified pituitary preparations on the nonprotein nitrogen constituents of blood, J. and H. FRAENKEL-CONRAT and H. M. EVANS. (Univ. Calif. et al.). (*Amer. Jour. Physiol.*, 137 (1942), No. 1, pp. 200-212).—Studies of the changes in the blood composition of about 650 normal and 120 hypophysectomized rats resulting from purified hormone injections indicated that thyrotropic hormone lowered blood urea directly as well as through stimulation of the thyroid, and controlled the amino acid level by direct action. The decrease in blood urea appeared due to a decreased production of urea in the liver. The

changes produced by the pituitary hormones on the blood nonprotein nitrogen of normal and operated animals are summarized.

Premature expulsion of eggs by hens following injection of whole posterior pituitary preparations, W. H. BURROWS and T. C. BYERLY. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 416-421).—Studies of premature expulsion of eggs from hens following injection of pituitary preparations by different routes (E. S. R., 84, p. 510) are reported. Intravenous injection of obstetrical pituitrin caused premature expulsion of the eggs in about 3 min. after they had entered the uterus but not at higher oviducal levels. Administration by intravenous means was about 10 times as effective as subcutaneous, intramuscular, or intraperitoneal routes. The expulsion of soft-shelled eggs required greater dosages than hard-shelled eggs.

Experiments on the source of ovarian androgen in the mouse, C. A. PFEIFFER and C. W. HOOKER (*Anat. Rec.*, 83 (1942), No. 4, pp. 543-571, pls. 2).—When ♂ mice were castrated and litter mate ovaries grafted in the ears with daily treatment with pregnant mare serum, there was distinct stimulation of the seminal vesicles, but no such androgenic effects followed injection with pregnancy urine, pituitary powder, follicle stimulating hormone, luteinizing hormone, progesterone, or smaller amounts of the pregnant mare serum. The androgen is thought to be secreted by vacuolated epithelioid cells derived from the old corpus luteum. The possibility is discussed that two factors may be involved—one in the formation of the granular cells, and another causing the vacuolation. In the conduct of the study 59 ♂s were castrated, and there were administered various gonadotropins with studies of the effects of androgens on the seminal vesicles.

Effect of testosterone propionate on spermatogenesis in hypophysectomized rats following the injection of gonadotropins, J. H. LEATHAM (*Anat. Rec.*, 83 (1942), No. 4, pp. 579-585, pl. 1).—Spermatogenesis was maintained for 30-35 days in hypophysectomized rats by testosterone propionate administrations. Testes weight was maintained in the androgen-treated rats, and many spermatozoa were present in the epididymides. Normal litters were sired by two hypophysectomized ♂s treated for 30 days with androgen injections.

Changing concepts of the antisterility vitamin (vitamin E), K. E. MASON (*Yale Jour. Biol. and Med.*, 14 (1942), No. 6, pp. 605-617, pl. 1).—The role of vitamin E and its synthetic product, the tocopherols, in the prevention of sterility and muscular dystrophy is noted in different classes of animals.

On the sex ratio in cattle, J. W. GOWEN. (Iowa and Maine Expt. Stas.) (*Jour. Hered.*, 33 (1942), No. 8, pp. 299-301, fig. 1).—In 3,559 cattle births there were 1,799 ♂s and 1,760 ♀s. Within sires' and dams' progeny and the effect of age the distribution of sexes was essentially at random.

Albinism in the Virginia deer, H. B. KELLOGG, JR. (*Jour. Hered.*, 33 (1942), No. 8, pp. 274, 284, fig. 1).—A note is given of a true albino Virginia deer found in Wisconsin.

The decline in annual egg production with age, D. V. ZANDER, I. M. LERNER, and L. W. TAYLOR. (Univ. Calif.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 455-461, fig. 1).—Data on 3 years' egg production pauses and persistency of 117 Single-Comb White Leghorns were analyzed statistically. These data showed general declines in the several components of egg production, all of which seemed to indicate that this decline as age advanced was not due to oocyte exhaustion but rather to the effects of senescence, as expressed by these component factors of annual production, and noted by Brody et al. (E. S. R., 50, p. 577). The major factor in the reduction in variance was accounted for by shortening of the length of the laying year with the decline in the rate, making a small but significant contribution to the decrease.

A "slide rule" for determining time intervals, D. MACLAURY. (Ky. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 462-463, fig. 1).—An ingenious slide rule method for indicating age at first egg, age at death, and other time intervals is illustrated and described.

FIELD CROPS

[Field crops research in North Carolina, 1941]. (Partly coop. U. S. D. A. et al.). (*North Carolina Sta. Rpt. 1941*, pp. 14-21, 22-27, 28-31, 32-38, figs. 10).—Progress reports are made on experimentation (E. S. R., 86, p. 33) concerned with production of their own hybrid corn seed by farmers; superiority of locally developed corn hybrids; poor adaptation of Corn Belt hybrids; increase of quality of table corn by sweet corn hybrids; increase of corn yields by turning under legumes; increase of cotton quality in North Carolina; improvements in yield and quality by recent developments in cotton breeding; breeding cotton for strength; variation of fiber diameter in improved varieties of cotton; influence of water relations within the cotton plant on fiber quality; number of cotton fibers as determined by growing conditions at blooming; importance of seed purity in all new cotton varieties; disease-resistant varieties as the best control for cotton wilt; obtaining more cotton seedlings from reginned and acid-delinted seed; search for more effective materials for treating cottonseed; K needs of cotton in rotation with peanuts; the value of lime and P in improving quantity and quality of feed and in increasing carrying capacity of pastures; stressing of better soil fertility in cooperative pasture demonstrations; profitable pasture improvement in Franklin County; lespedeza as a crop to precede grasses on poor land; better grassland plants for North Carolina; Ladino clover as a promising legume in lower coastal plain pastures; improvement of carpet grass pastures by disking and legumes; small grains as good grazing crops; a wide variety of grazing crops used in the coastal plain; feeding of soybean silage to heifers; B as essential for good production of alfalfa; control of leafhopper on alfalfa by delayed cutting; cutting sericea lespedeza at correct time for good hay; need of red clover for lime, P, and K; nutrient deficiency symptoms in peanuts; response of peanuts to lime and K; peanuts as a soil-depleting crop; increase in peanut yield due to early planting and seed inoculation; yield differences among peanut varieties and strains; varieties of soybeans for seed; low small grain yields resulting from poor cultural and fertility practices; value of applying P to small grains in western North Carolina; Sunrise, a new winter barley for North Carolina; release of oats resistant to cold and disease to North Carolina farmers; development of rust-resistant wheats; introduction of new varieties of flue-cured tobacco; gains in tobacco quality and yield as due to fertilizer placement, more K, and rye cover crop; poorer root growth of tobacco on extremely acid soils; need for less fertilizer on tobacco plant beds; controlling weeds and disease in tobacco plant beds; rotations as factors in control of tobacco root diseases; and *Fusarium* wilt of sweetpotato as also attacking tobacco.

[Crops for wartime farming] (*West Virginia Sta. Cir.* WS 1 (1942), pp. [8]; WS 2, pp. [8], fig. 1; WS 3, pp. [8], figs. 3; WS 4, pp. [8], fig. 1; WS 9, pp. [8], figs. 7).—The circulars in this group are entitled Plant Hybrid Corn for Victory, for Profit, by E. J. Wellhausen; Supplementary Pastures, by F. W. Schaller and H. O. Henderson; Soybeans, by R. O. Weibel; Grass Silage for West Virginia, by H. O. Henderson, E. A. Livesay, and A. H. VanLandingham; and Winter Barley, by R. O. Weibel. Practical information is given on varieties, cultural methods, and management and harvesting practices.

Pastures for the Coastal Plain of Georgia, J. L. STEPHENS. (Coop. U. S. D. A.). (*Georgia Coastal Plain Sta. Bul.* 27 (1942), pp. 57, pl. 1, figs. 3).—

Methods for establishing lowland and upland permanent and winter and summer pastures are outlined; the merits and adaptations of native and introduced grasses, lespedezas, clovers, bur-clovers, and kudzu are set forth; and seed mixtures are indicated for different situations. The information is based largely on studies in grass nurseries and grazing tests on lowland (mainly Plummer sandy loam) and upland (Norfolk and Tifton sandy loams) soils.

For lowland permanent pasture, a seed mixture of carpet grass 10 lb., Dallis grass 8, common lespedeza 12, and white clover 5 lb. is recommended. In fertilizer tests on lowland pasture such a mixture gave the highest gain in beef per acre on a 6-12-6 complete fertilizer. Growth of white clover and lespedeza was best on pastures receiving P fertilizer. On lowland pastures gains in beef per acre were most rapid in early spring and diminished soon in late summer, which indicated the desirability for supplemental summer temporary pastures. The ratio of grass yield to beef gains has varied with different fertilizer treatments.

Kudzu has given excellent gain in beef per acre when grazed continuously throughout the summer if not overgrazed. Best results have been obtained on heavy type soils when stable manure (1-2 gal. per hill) was used at the time of setting out the crowns. The growth of kudzu after 5 or 6 yr. of grazing could be invigorated by applying from 2 to 5 tons per acre of manure during winter, then in late February, when crowns are ordinarily planted, the field plowed deeply with a two-horse turn plow.

For upland pasture, Bermuda grass and common lespedeza have given best gains. New selections of Bermuda grass, e. g., "Tift" Bermuda, are upright in growth and heavy yielders, promising for hay when fertilized or for grazing. Maintenance of Bermuda grass pasture by breaking with a turn plow at intervals about every 3 yr. appeared to be very important. Centipede grass has not provided satisfactory grazing even when fertilized. Oats, mixed with hairy vetch, has given highest beef gains on winter temporary pastures, and oats or Abruzzi rye also have been good winter temporary pastures. The best summer temporary pastures tested were cattail millet, lespedeza, and soybeans. In fertilizer tests Bermuda, carpet, and centipede grasses responded most to N on semiupland soils previously in cultivation, but the maximum yield came from complete fertilizer. Pastures on soils never in cultivation have responded well to P, especially when legumes were included in the seed mixture. From 400 to 600 lb. per acre of 6-12-6 fertilizer on carpet grass have given most economical increase in yield. Application of all fertilizer in spring gave the best distribution of grass growth through the summer and also gave a greater total yield of grass than split applications.

1939 and 1940 reports of the uniform alfalfa nurseries, H. L. WESTOVER and H. M. TYSDALE. (Coop. 41 expt. stas.). (*U. S. Dept. Agr., Bur. Plant Indus., 1940, pp. [3]+59; 1941, pp. [2]+27*).—Resembling previous reports (E. S. R., 82, p. 177) in general scope, these publications give detailed data on characters of alfalfa strains concerned with forage and seed yields, disease resistance, and stand longevity, as well as on various growth characteristics as reported from stations in 31 States and one Canadian Province in 1939 and in 29 States and one Province in 1940.

Smooth bromegrass in Missouri, E. M. BROWN. (Coop. U. S. D. A.). (*Missouri Sta. Cir. 243 (1942), pp. [2]*).—Brief recommendations are made on soils, choice of strains, seeds mixtures, companion crops, seedbed preparation, and planting practices involved in growing smooth bromegrass (*Bromus inermis*) for hay, pasture, and seed in Missouri.

Yields of corn hybrids harvested for silage, and methods to determine best time to harvest. W. B. NEVENS and G. H. DUNGAN (*Illinois Sta. Bul.* 494, (1942), pp. 385-412, figs. 2).—Yields of hybrid corn for silage were compared with those of open-pollinated corn, and certain Illinois hybrids were compared for silage with commercial hybrids at the station 1935-41. Hybrid corn surpassed open-pollinated corn in quantity and quality of forage produced. The Illinois hybrids and commercial hybrids were equally satisfactory for silage purposes, and both were superior to the open-pollinated variety used for comparison.

Station Yellow Dent, an open-pollinated variety found in previous trials to be high yielding for both grain and forage and used as the check entry from 1935-39, had a lower percentage of ears and fewer tons of dry matter than most of the hybrids. It showed more lodging, and this probably was partly responsible for the lower yields and a smaller percentage of ears than the hybrids. Most of the Illinois hybrids tested proved satisfactory for silage purposes, their performance in terms of yields of dry matter, percentage of ears, and lodging resistance usually equaling or surpassing that of Station Yellow Dent and of Funk Hybrid G-94, the commercial hybrid used as a check entry 1940-41. Only a few Illinois hybrids were considerably below average in performance, and their lower ratings were due largely to poor adaptability to the region where they were grown and in a few instances to their tendency to lodge. The best Illinois hybrids for use as silage in central Illinois, according to these tests, are Illinois Hybrids 206, 442, and 863. Ratings of hybrids for adaptability to different sections of Illinois, for yields of forage for silage, and for yields of grain are tabulated.

When the corn crops in this study contained about 30 percent dry matter (a suitable silage-harvest stage), the ears contained from 40 to 50 percent and the stalks about 20 percent. Since the leaves had about the same percentage as the entire crop, the suggestion was that the dry matter content of the leaves can be used with nearly as good results as the dry matter content of the entire crop, as an index to the best harvesting time for silage. Earlier recommendations of the station were confirmed by these trials, i. e., a dry matter content of 30 percent in the corn crop is a good stage for silage harvest. Kinds of corn which usually mature the grain should be chosen for silage purposes. Practical directions for finding dry matter content are outlined.

Leoti for starch. R. L. CUSHING (*Nebraska Sta. Cir.* 69 (1942). pp. [41]).—Leoti sorgho, a popular sorghum giving satisfactory yields in most parts of Nebraska and also suitable for sirup, has a waxy endosperm found to produce starch with properties similar to those of tapioca starch. Experimental data indicate that on the average, Leoti may be expected to yield about 70 percent as much as Early Kalo, the most widely used grain sorghum variety in Nebraska, while in areas where sorghums are best adapted, particularly in the central and south-central area, Leoti may be expected to compare favorably with corn in grain yield. Cultural practices and harvesting methods permitting saving of the grain and utilizing the forage efficiently are set forth briefly. Suggestions on how to produce Leoti grain for the starch industry call for planting only seed proved by chemical test to have pure waxy endosperm, avoiding cross-pollination by other sorghums, and treating sorghum seed for control of kernel smut.

The station recommendation is that "if a farmer is planning to grow some forage sorghum anyway, he might plant suitable seed of Leoti. In this way he will be satisfying his forage requirements and should also have some grain to sell, should the market materialize. At the present time, no expansion of the Leoti acreage is encouraged solely for the production of grain."

Gibson and Patoka soybeans, G. H. CUTLER and A. H. PROBST. (Coop. U. S. D. A.). (*Indiana Sta. Cir.* 270 (1942), pp. 8, figs. 8).—Gibson is a new yellow-seeded variety selected from Dunfield \times Midwest and Patoka a pure line yellow-seeded selection from P. I. 70218-2. Data are given on their adaptations, agronomic and chemical characteristics, and yields in comparison with standard varieties. Gibson, ripening in about 145 days, and Patoka, in from 138 to 141 days, are later than the available standard yellow-seeded varieties, as Dunfield, Illini, Manchu, Mandell, and Richland, give higher yields of better-quality grain, and are generally better adapted to the important soybean producing area of southern and southwestern Indiana. These two varieties have compared favorably with Kingwa in tonnage but do not produce hay of as fine quality.

Las habichuelas soya, un nuevo cultivo para Puerto Rico [Soybeans, a new crop for Puerto Rico] (*Agr. Expt. [Puerto Rico Univ. Sta.]*, 2 (1942), No. 4, pp. [12], figs. 9).—Practical information on growing soybeans in Puerto Rico, based in part on experiments by the station, deals with varieties; cultural and harvest practices; value of soybeans as food, feed, and forage and green manure, and for industrial purposes; and composition of soybeans compared with other legumes and cereals. Productive adapted varieties include Mammoth Yellow, U. S. D. A. 82284, Tokio, Arisoy, Biloxi, Pee Dee, Ootootan, Clemson, Avoyelles, Macoupin, Richland, and Palmetto, and the edible types Easycook and Rokusun. Recipes for edible soybeans (E. S. R., 87, p. 740) are included.

Results of seed tests for 1942, B. G. SANBORN (*New Hampshire Sta. Bul.* 341 (1942), pp. [1]+11).—Germination and purity percentages are tabulated for 298 official samples of field and forage crop seed collected from dealers in New Hampshire during the year ended June 30, 1942.

Coco or nut grass can be eliminated by persistence with plow, hoe, cultivator, O. A. LEONARD (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, pp. 1, 8).—Effective control of nutgrass by cultivation is reported.

HORTICULTURE

[**Horticultural studies by the North Carolina Station**]. (Partly coop. U. S. D. A.). (*North Carolina Sta. Rpt.* 1941, pp. 39-40, 41-45, 46, 49-50, figs. 8).—Among studies, the progress of which is reviewed, are the storage of apples in modified atmospheres, the use of nematode-resistant Shalil peach rootstocks, the use of chloropicrin and other chemicals for disinfecting soils from which old peach trees were removed, chemical control of peach tree borers, the nutritive requirements of the strawberry, the time factor in fertilizing strawberries, vitamin C in sun-ripened v. shade-ripened strawberries, the renovation of strawberry beds, the breeding of carnations, and the development of a new pecan named Cape Fear.

[**Horticultural studies by the Vermont Station**] (*Vermont Sta. Bul.* 495 (1942), pp. 29-30, 31, 32-34, fig. 1).—Among studies by M. B. Cummings and C. H. Blasberg, the progress of which is reviewed, are fruit setting and progeny fertility in pears, nature and causes of bitter pit in apples, methods of preventing biennial bearing in the apple, spraying apple trees with naphthalene acetic acid and its derivatives, and fertilization of apple trees.

An accurate fertilizer applicator for field test plots, J. P. FAIRBANK and P. A. MINGES. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 310-314, figs. 3).—The construction and operation of an effective machine are discussed.

A summary of starter solution experiments on tomatoes and cabbage at State College, Pennsylvania, E. M. RAHN. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 305-309).—As a result of 4 years' work with tomatoes

and 1 year with cabbage, the conclusion is reached that certain starter solutions are effective in increasing yields, particularly early yields of both vegetables. There were indications that phosphorus is probably the most important element for the tomato and nitrogen for early cabbage, but that starter solutions containing nitrogen, phosphorus, and potassium should be used in general practice. Certain effective formulas are outlined. Treatment of roots of tomato transplants with 10 p. p. m. solutions of indolebutyric acid and vitamin B₁ did not increase yields, and in one season the indolebutyric acid reduced total yields.

The influence of irrigation water on the yield and quality of sweet corn and tomatoes, with special reference to the time and number of applications, H. B. CORDNER. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 475-481, figs. 2).—Yields of sweet corn and tomatoes when grown in north central Oklahoma may be increased substantially by a few well-timed irrigations. With sweet corn, irrigations applied at silking time and later when the ears were developing were most helpful. Presilking irrigations appeared to promote vegetative growth without benefit to yield of ears. With tomatoes, light irrigations which undoubtedly caused marked variations in surface soil moisture were actually detrimental to fruit set. In most cases increased yields obtained from irrigated tomatoes were attributable to increased plant size and not to increased fruit set. Irrigations applied during the preharvest period were most beneficial to fruit production. In certain plots irrigated during the harvest period, the percentage of fruits affected with blossom end rot was increased. The greatest yields were obtained when the tomato was irrigated throughout its entire growing season.

Influence of photoperiod on the time of flower primordia differentiation in the Perfection pimiento (*Capsicum frutescens* L.), H. L. COCHRAN. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 493-497, fig. 1).—Perfection pimiento peppers grown in 6-in. pots filled with fertile potting soil were given different periods of light exposure. No flower bud differentiation occurred in plants under the 0- and 6-hr. day lengths, but it did take place under 8-, 10-, 14-, 18-, and 24-hr. periods and in normal (12-hr.) days. Differentiation occurred first in the normal-day plants, 23 days after they emerged from the soil. A total of 26, 26, 27, 28, and 31 days was required under the 8-, 10-, 14-, 18-, and 24-hr. treatments, respectively. With but one exception, the time of appearance of the first visible buds occurred in the same order under the various photoperiods as the primordia were differentiated. Growth of the plants at the time of primordia differentiation, as measured by height and green weight, varied directly with the photoperiod under which they were grown.

Field plot technique studies with tomatoes, J. D. HARTMAN and E. C. STAIR. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 315-320).—Calculations based on uniformity trial data with tomatoes showed that when one treatment or variety is to be compared rather accurately with a few others, and when comparisons between any two of these other treatments or varieties are of secondary importance, the use of long alternate row check plots seems to be an efficient and practical design. From alternate check plots the data should be analyzed as differences between the yields of rows of treatments other than the check and the means of the two adjoining check rows. The use of smaller plots with 24 complete blocks did, however, give more reliable means for treatments than did the alternate row check method. With complete blocks, of course, all comparisons were equally accurate.

Even with only 16 different varieties or treatments, the arrangement of 5 replicates of single-row plots 96 ft. long in balanced incomplete blocks produced a standard error of a mean difference as small as could have been obtained with 7 replicates had the plots been grouped only in complete blocks. For either 4 or

16 different treatments, single-row plats 96 ft. long seem preferable to 4-row plats 24 ft. long when rows are spaced 6 ft. apart. This statement is true when plats of each shape are arranged in designs best adapted to their shapes.

Correlation between fresh weight and area of tomato leaves, F. A. ROMSHÆ (Okla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), p. 482).—The fresh weight of tomato leaves in plants grown in the greenhouse proved to be an accurate measure of relative leaf area and could be used in comparative studies involving this factor. The ratio of area to weight of the leaflets was 5.7:1 and for the entire leaves 3.4:1.

Sand culture studies of the effects of various concentrations of added salts upon the composition of tomato plants, R. F. WALL and E. L. HARTMAN. (Okla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 460-466, figs. 6).—The results of investigations with Marglobe tomatoes grown in fine quartz, supplied with a nutrient solution to which various salts were added, indicated that the coordinated effects of temperature, light, relative humidity, transpiration, and respiration as they affect salt absorption must be considered in adequately defining salt toxicity, as salt absorption (and therefore salt injury) parallels the transpirational and respirational processes of the plants and the variations so produced are very large. Salt toxicity is apparently due to high ionic concentration, reduction in availability and/or absorption of the other ions, and the effect of the induced pH. The pH toxicity exceeds the other toxic factors with NaHCO_3 ; with other salts the pH effect is subordinate.

Experiments in plowing under coarse organic matter for tomatoes, J. D. HARTMAN and E. C. STAIR. (Purdue Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 471-474).—The comparatively light-colored Crosby silt loam and silty clay loam tomato soils of central Indiana rarely produced as well as the darker Brookston silty clay loam, even when supplied with relatively large amounts of fertilizer. The addition to Crosby soil of large quantities of organic matter and sufficient nitrogen to make a nitrogen to carbon ratio of 1:20 in the added material failed to increase significantly the yields of tomatoes. This was true when organic matter was added to the soil in spring and when it was grown on the ground the summer preceding the tomato crop. There was, in fact, some indication of a detrimental effect of plowing under large amounts of coarse organic material.

Effect of nutrient root media on loss in weight and amount of rot in stored tomatoes, J. H. MACGILLIVRAY. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 289-292).—Best of All tomatoes grown in various soil and nutrient media were picked at the usual greenhouse-ripe stage and stored at 55° and 77° F. All of the plants had made average or better growth, but analyses of the leaves and fruit showed certain compositional differences associated with the nutrient supply. Fruit yields indicated a somewhat greater variability in physiological state than did the analyses. As to behavior in storage, the various media did not materially affect the amount of rot or weight loss of the fruit.

Studies of gray-wall of tomato, O. A. LORENZ and J. E. KNOTT. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 445-454, figs. 2).—"Gray-wall," manifested in a grayish discoloration of the surface, is due to the development of a dark chlorophyll layer in the parenchymatous cells of the wall tissues. Since the wall on the side of the fruit which was exposed to the sun may be less than one-third as thick as that on the unexposed side, the authors suggest that the name "thin-wall" would be more descriptive than gray-wall. In severe cases over 20 percent of the tomatoes may be discolored in the packing sheds. It is believed that the trouble results from the high light in-

tensity prevailing in California. The heat effect accompanying the high light is believed to cause the thin-wall condition. In fruits that develop to their approximate size in the shade of the vines and are then exposed, sunscald usually develops without pronounced symptoms of thin-wall. The authors recommend the use of varieties that produce an abundance of foliage to protect the fruits and the protection of plants from defoliation. Fertilizers that promote vigorous growth are desirable.

Wheel injury to tomatoes during spraying and dusting operations, J. D. HARTMAN and R. W. SAMSON. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 467-470, fig. 1).—Wheel damage to tomato vines during spraying and dusting operations resulted in an average reduction in yield of 5 percent in rows which were injured on one side only and 8 percent on rows injured on both sides. All wheels were equipped with vine shields. The degree of injury was practically the same whether the plants were sprayed or dusted five times or received only two delayed applications. When the total yield from all rows covered by the boom was considered, the average reduction in yield for a 6-row sprayer was 2.3 percent. For 8-, 10-, and 20-row outfits the average reductions were computed at 1.8, 1.4, and 0.7 percent, respectively.

Pruning, fertilization, and spraying are necessary for successful home orchards, E. A. CURREY (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, p. 1).—Information is presented on the pruning, spraying, and fertilization of fruit trees.

Dormant sprays for scale insects and orchard diseases, T. H. JONES (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, p. 8).—Information is given on the preparation and application of various sprays for the control of such pests as San Jose scale, peach leaf curl, etc.

Choice of parent as influencing seed germination in fruits, H. P. OLMO. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 171-175).—Poor seed germination in cultivated fruit may be avoided by proper selection of the mother parent. The Pearl of Csaba grape, when selfed or crossed, yielded less than 2 percent of fertile seeds. Pearl of Csaba pollen applied to Champion stigmas yielded many seedlings. Other cases of good results from the use of ovule parents with high seed viability are mentioned. A similar situation was observed in the peach, where Mayflower (ovule parent) was crossed with Lukens (pollen parent) and yielded a high percentage of fertile seed, while the reciprocal yielded none. Seed abortion of some fruit varieties, since it is largely determined by the genotype of the maternal tissue and not so much by hybridity of the developing zygote, must be attributed to the abnormal growth or nutrition of the maternal tissues, the abortion of the embryo or endosperm being a secondary reaction.

Studies of alternate bearing in the apple, M. J. DORSEY and R. L. McMUNN. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 37-44).—Yield records on young trees of Grimes Golden, Jonathan, and Delicious showed a marked persistence of biennial bearing following the first heavy crop. The trees were neither fruit thinned or treated in any special manner and thus represented the normal picture of fruiting in apple trees. Fruit removal studies indicated that varieties respond differently to such treatment. Timeliness of defruiting was a definite factor, with evidence that after a certain period it is probable that not even the complete removal of the fruit will result in sufficient fruit bud formation to produce a crop the succeeding season. Complete crop loss at any time up to full bloom resulted usually in a heavy bloom the next season.

Root-inducing substances effective on apple cuttings taken in May, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp.

292-297, *figs. 2*).—Cuttings of McIntosh, Grimes Golden, N Spy, Rhode Island Greening, Stayman Winesap, and Yellow Transparent treated with various root-inducing substances gave relatively high per of rooting in from 5 to 6 weeks when the cuttings were collected in the by 9 to June 3. Better success was attained during this period when cuttings were placed in sand than when in a sand-peat mixture. The detrimental effect of peat was not shown by cuttings taken in June and later. Treated cuttings rooted satisfactorily when the air was about 70° F. during the day and when cheesecloth was placed over the cuttings. It is suggested that apple cuttings should be made when the new shoots are from 4 to 7 in. long, treated with an 8 mg./gm. powder preparation of indolebutyric acid, and then planted in sand in shaded greenhouse benches.

Trunk diameters of young apple trees on clonal stocks, J. K. SHAW. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 269-271).—Data are presented on the diameter of the trunks of several varieties of apples grown on clonal rootstocks. There appeared to be no correlation between the known vigor of the top variety and the enlargement at the bud union. In all cases the diameter below the union was larger than that above. Apparently the behavior at the union of the young trees in their first 3 yr. in the orchard gave little evidence upon which to base orchard value.

Growth and yield of Steele Red apple trees as influenced by the use of various double-worked interstocks, F. N. HEWETSON. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 264-268).—Red Canada (=Steele Red), a variety with a reported lack of vigor, was top-worked on a number of intermediates including Fameuse, Haas, Jonathan, Northern Spy, Red Astrachan, Tolman Sweet, Virginia Crab, and Yellow Bellflower. Trees on Red Canada and seedling interstocks were introduced for comparison. Trees on Northern Spy intermediates were among the largest as well as the most productive. Fameuse, Haas, Jonathan, and Red Astrachan appeared to invigorate the top but not necessarily the yields. In fact, Red Astrachan interstocks reduced yields to a significant degree. Virginia Crab resulted in the smallest trees but by far the highest yields.

Further observations on a narrow-leaf variation of the apple, A. P. FRENCH and L. SOUTHWICK. (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 245-247, *figs. 2*).—In this second paper (*E. S. R.*, 72, p. 335) there is discussed the growth of young nursery trees propagated from narrow-leaf branches of Baldwin, McIntosh, and Red Astrachan. With Baldwin, from a total of 50 successful buds only 2 produced entirely normal Baldwin growth and 3 both normal and abnormal parts. The normal growths on these trees originated always as laterals near the base of the whip. Attempts to obtain entire trees of the narrow-leaf type by repeated pruning of the normal shoots were unsuccessful, with indications that the normal type of tissue would apparently eventually prevail.

Preliminary observations on the fruiting of varieties other than Grimes on Virginia Crab stocks, J. A. McCLINTOCK. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 275-276).—Among trees of several varieties top-worked on Virginia Crab and planted in 1936, Golden Delicious was first to come into production with some fruit in 1939. Turley and Gallia Beauty bore fruit in 1940. Grimes Golden, McIntosh, and Blaxtayman fruited first in 1941, while Blackjon Jonathon, Richared Delicious, and Starking Delicious had not produced at all through 1941.

Respiration and oxidase and catalase activity of apples in relation to maturity and storage, B. D. EZELL and F. GERHARDT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 10, pp. 453-471, *figs. 12*).—The effect of matu-

rity on the rate of aspiration and on the oxidase and the catalase activity of apples was studied. Respiration decreased during the early part of the growing season and reached a maximum prior to the commercial harvesting of the fruit. The time intervening between harvest and the measurement of the respired carbon dioxide may determine whether or not a later increase is shown. Oxidase activity decreased during the growing season and may or may not increase if the fruit is left on the tree past the normal harvest season. Catalase activity increased from July to November. Fruit harvested when fully mature *usually* showed a higher respiratory activity, a higher catalase activity, and a lower oxidase activity in storage than did fruit picked when less mature.

Orchard identification of stone fruit rootstocks, L. H. DAY. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 272-274, fig. 1).—The author points out some of the distinguishing morphological and color characteristics of the roots of the apricot, Myrobalan plum, almond, peach, and mahaleb and mazzard cherries that would be useful in identification of the rootstocks upon which orchard trees had been propagated.

Overgrowth produced by edible cherry on Sargent cherry (*Prunus sargentii* Rehd.), L. E. JOLEY. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 277-278, fig. 1).—In a test of the Sargent cherry as a possible rootstock for edible cherries, successful unions were obtained in most varieties, but in all cases the scions quickly overgrew the stocks. This overgrowth was so striking, even in young nursery trees, that the author concluded that the Sargent cherry is not adapted as a rootstock for cherries.

Rest period requirements for blueberries, G. M. DARROW. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 189-194, figs. 3).—Tests of the length of rest period requirements of the standard highbush blueberry varieties in comparison with the rabbiteye species of north Florida showed none of the highbush varieties to grow at all when introduced into the greenhouse either on October 15 or November 15. On the other hand, the rabbiteye variety Pecan did not start well in the October 15 lot but grew vigorously when brought in on November 15. In the December 15 lot, the highbush varieties all made more or less growth of flower buds, with variations in vegetative development. The January 15 and February 15 lots started both flowers and vegetative buds freely. In the following season, determinations were made of the approximate number of hours of chilling required. Pecan appeared to have completed its rest after 250 hr. of chilling. Weymouth, Rancocas, Wareham, and Cabot appeared to have partially completed their rest after 650 hr., but did better after 800 hr. For all others, except Jersey, 1,060 hr. appeared adequate.

Effect of renovation of beds after harvest on yield and grade of strawberries, E. B. MORROW and G. M. DARROW. (N. C. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 195-197, figs. 4).—Data presented on the renovation of strawberry beds showed that 2-year-old beds produced greater yields than renovated beds. The 1938 yield for Blakemore was 61 percent greater than for the old double row, 22 percent for the old triple row, and 57 percent greater for the old matted row. In 1941 the 2-year-old beds outyielded both the renovated and 1-year-old beds for Blakemore and Fairmore. The berries were larger and the percentage of No. 1 fruit was greater on the 1-yr. plants. However, the differences in size and grade were not enough to make up for the considerably lower yields in comparison with the old beds.

Examples of incompatibility between grape varieties and rootstocks, H. E. JACOB. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 201-203).—Among examples of serious degrees of incompatibility were Emperor.

Molinera (Red Malaga), Palomino, and Aramon on the stock *Berlandieri* × *Rupestris* 57-Richter. Not a single successful bench graft was obtained, although buds succeeded normally when placed on other roots. Other failures were Grenache on *Berlandieri* × *Riparia* 5-A (Teleki) and Cortese and Barolo on Aramon × *Rupestris* No. 1 (Ganzin). Tinta Amarella on Mourvedre × *Rupestris* 1202 (Couderc) failed after a brief period.

Nitrate content of grape leaf petioles as an indicator of the nitrogen status of the plant. A. ULRICH. (Univ. Calif. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 213-218).—Significant differences were recorded in the nitrate, soluble, and total N contents of leaf petioles in favor of the N-treated plats on each sampling date. With insoluble N, significant differences were recorded in the May 14 and September 3 samples, but not in the July 10 samples. When hog manure was used as a fertilizer, the yields were not increased the first season but later equaled those of plats receiving ammonium sulfate. The nitrate content of the leaf petioles failed, however, to equal that of the ammonium sulfate plats. Applications of grape pomace to vines over a 3-yr. period did not appreciably increase yields or the nitrate content of the petioles. The nitrate content of grape leaf petioles from the most recently matured leaves reflected the N status of the vines to a greater degree than did the nitrate content of the blades or the soluble, insoluble, and total N content of the petioles or blades.

Potassium content of grape leaf petioles and blades contrasted with soil analyses as an indicator of the potassium status of the plant. A. ULRICH. (Univ. Calif. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 204-212, figs. 2).—Analyses of leaf samples collected periodically from grapevines growing on two different soils with approximately the same K content, as shown by the Nénbauer and replaceable methods, reflected more closely the true K status of the vines than did the soil data. The yields for three consecutive summers were directly related to the K contents of the leaf petioles, and petiole determinations were more satisfactory than those made on leaf blades. The earlier the occurrence during the growing season of minimum K values in grape leaf petioles, the greater was the possibility of a response from K applications.

Storage of grape pollen. H. P. OLMO. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 219-224).—Pollen of three vinifera grapes, Muscat of Alexandria, Sultanina, and Monukka, maintained viability best at a temperature of -12° C. (10.4° F.) and a relative humidity of 28 percent. One lot of Monukka pollen following an initial germination of 34 percent showed 21 percent viability after 4 yr. Pollens showing 3 percent or less germination in vitro were practically worthless, while those of 6 percent or higher may give berry sets equivalent to normal. Pollen stored under the most favorable conditions gave, after 4 yr., berry sets equal to fresh material. Seedlings grown from pollination with 3-year-old pollen appeared as vigorous as those produced with fresh pollen.

Pollen germination in the avocado. C. A. SCHROEDER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 181-182).—Numerous attempts to germinate avocado pollen by ordinary technics using sugar solutions failed, apparently because of the lack of some essential substance or condition necessary to growth. The addition of yeast, vitamin B₁, and crushed stigmatic tissues did not affect germination. Satisfactory germination was obtained by placing pollen grains directly on the stigmas at temperatures of 40° F. or above. Pollen of the *Leucadia* variety germinated readily after storage for

32 days at 40° in a desiccator over calcium chloride. Fuerte pollen germinated after 153 days at 59°.

Nut tree culture in Missouri, T. J. TALBERT, (*Missouri Sta. Bul.* 454 (1942), pp. 32, figs. 16).—Information is presented relative to the several nut species that grow in Missouri, cultural requirements, propagation by grafting and building, handling of the scions, uses of nut trees, value of nuts for food, uses of the wood, etc.

FORESTRY

[Forestry studies by the Vermont Station] (*Vermont Sta. Bul.* 495 (1942), pp. 25–27).—Included are reports on studies by G. P. Burns and W. R. Adams of photosynthesis in forest trees, the effect of tree spacing on diameter development, natural reproduction in forest plantations, and thinning and related silvicultural practices in natural-seeded and planted forests.

The virgin upland forest of central New England: A study of old growth stands in the Pisgah Mountain section of southwestern New Hampshire, A. C. CLINE and S. H. SPURR (*Harvard Forest Bul.* 21 (1942), pp. 58, figs. 12).—This is a study of species, succession, and influence of various factors such as fire and streams.

Effect of thiamin and niacin on growth of jack-pine seedlings, D. W. BENSEND. (Minn. Expt. Sta.). (*Jour. Forestry*, 40 (1942), No. 11, pp. 883–884).—Seedlings grown in jars of sterile sand supplied by irrigation from below with a standard balanced cultural solution were treated differently with respect to thiamin and niacin. Under the conditions of the experiment neither substance had any effect on the root or stem growth of the seedlings. There was no significant difference in the thiamin content of the seedlings receiving or not receiving thiamin, suggesting that jack pine, if given the proper raw materials, can synthesize enough thiamin for its own use.

Early responses to weeding in some eastern mountain hardwoods, A. A. DOWNS. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 11, pp. 865–872).—Analyses of repeated measurements on permanent study areas in the southern Appalachians showed that weeding was generally beneficial except for a negative reaction in the dominant crown class of yellow poplar. Weeding stimulated diameter growth particularly in the lower crown classes, increased height growth somewhat in the lower crown classes, and reduced mortality. Weeding was particularly beneficial in raising or maintaining the crown class of released trees, thus preventing suppression. Response to weeding differed between species, increased with lower crown class, and increased with better vigor.

Results of second remeasurement of Adirondack cutting plots, A. B. RECKNAGEL and M. WESTVELD. (Cornell Univ. and U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 11, pp. 837–840).—An analysis of measurements taken in the fall of 1940 on a series of five 28-acre plats established in 1930 and measured in 1941 (*E. S. R.*, 70, p. 341) led to the conclusion that in mixed spruce-hardwood stands of the character involved no net increase in merchantable volume of spruce and fir would probably occur for a period of at least 9 or 10 yr. after cutting. Following cutting in mixed spruce-hardwood stands, the unmerchantable size class is the major softwood-contributing component. Advance conifer reproduction, usually plentiful prior to cutting, may be reduced seriously during logging. When stands are cut for conifers only, the remaining hardwoods are likely to impede the development of understory softwoods for many years unless girdled or removed. In young growth, the usual predominance of spruce over fir is reversed and future pulpwood crops will have a greater proportion of fir than did the original stand.

DISEASES OF PLANTS

[Abstracts of papers on plant diseases and their control] (*Assoc. South. Agr. Workers Proc.*, 43 (1942), pp. 46-49, 173-174, 202-207, 208-209, 210).—The following are included: Results Obtained in Breeding Disease-Resistant and Hardier Oats for the South, by T. R. Stanton, F. A. Coffman, and H. C. Murphy (pp. 46-47) (U. S. D. A.); Disease Studies With White Clover in Alabama, by H. R. Albrecht (p. 48) (Ala. Expt. Sta.); Seed Treatment Studies of Vegetable and Ornamental Plants, by L. H. Person and S. J. P. Chilton (pp. 48-49) (La. Sta.); Effects of Certain Cropping and Cultural Treatments on Cotton Root Rot, by C. H. Rogers (p. 49) (Tex. Sta.); Recent Developments on the Control of Cucurbit Diseases, by C. J. Nushbaum (p. 173) (S. C. Sta.); Iron Deficiency of Tung in Florida, by R. D. Dickey (pp. 173-174) (Fla. Sta.); Varietal Rating of Plums With Reference to Canker Resistance, by W. S. Flory, Jr. (p. 174) (Tex. Sta.); Breeding Tobacco for Black Root-Rot Resistance, by R. G. Henderson (p. 202) (Va. Sta.); Results of Seed Treatment Tests on Peanuts, by L. Shaw (pp. 202-203) (Univ. N. C.); Results of Cottonseed Treatment Tests in 1941 in Texas, by C. H. Rogers (p. 203) (Tex. Sta.); Studies on Soil Sterilization With Urea and Calcium Cyanamid, by R. G. Henderson (pp. 203-204) (Va. Sta.); Chemical Control of Root-Knot, by A. L. Taylor (p. 204) (U. S. D. A.); Results of Preliminary Experiments on the Control of Root Diseases of the Peach, by L. Shaw (pp. 204-205) (Univ. N. C.); Further Studies on the Reaction of Commercial Cotton Varieties to Root-Knot Nematode, by A. L. Smith (p. 205) (U. S. D. A. and Ga. Sta.); Root-Knot Resistance of Five Soybean Varieties, by A. L. Taylor (p. 205) (U. S. D. A.); Populations of Root-Knot Nematode Larvae in Two Kern County, California, Fields, by G. Thorne, M. W. Allen, J. Hare, and M. A. Lindsay (pp. 205-206) (U. S. D. A. et al.); and Observations on the Distribution of the Root-Knot Nematode in High Ridge Plantings of Potatoes and Tomatoes, by G. Thorne (p. 206) (U. S. D. A.); Cotton Seed Treatments and Angular Leaf-Spot Control, by V. H. Young (p. 207) (Ark. Sta.); Oospore Production in Cabbage Seedlings by *Peronospora parasitica* (Pers.) Fr., by F. J. LeBeau and J. A. Pinckard (p. 207) (Miss. Sta.); Cottonseed Treatment With Dust Preparations Containing Hormones Alone and in Combination With Ceresan and Spergon, by S. G. Lehman (p. 208) (Univ. N. C.); The Effect of Depth of Planting on Fuzzy and Acid-Delinted Cotton Seed, by W. W. Ray (p. 209) (Okla. A. and M. Col.); The Importance of Determining the Concentration of Carbon in Plant Extracts in Diagnosing Mineral Deficiencies by Plant Tissue Tests, by E. M. Emmert (p. 209) (Univ. Ky.); and Performance of Copper Dusts From the Standpoint of Their Inert Ingredients, by A. A. Nikitin and E. G. Anderson (p. 210).

[Papers on plant protection] (*Internatl. Crop Impr. Assoc. Ann. Rpt.*, 23 (1941), pp. 8-38, fig. 1).—The following are included: Opportunities in Seed Certification, by A. L. Clapp (pp. 8-11); Seed Certification a National Asset, by R. I. Throckmorton (pp. 11-15) (Kans. State Col.); A National Policy on Plant Disease Control, by C. R. Orton (pp. 15-21) (W. Va. Univ.); Effect of Seed-Borne Micro-organisms on Germination, by W. Crosler (pp. 22-25) (N. Y. State Expt. Sta.); Disease Infection in Hybrid Seed Corn, by B. Koehler (pp. 26-31) (Ill. Sta.); and Transmission of Diseases on and in Cotton Seed, by W. N. Ezekiel (pp. 32-38) (Tex. Sta.).

Division of Agricultural and Food Chemistry of the American Chemical Society: Abstracts of papers presented at Memphis, Tenn., April 20 to 24, 1942 (*Amer. Chem. Soc. Mtg.*, 103 (1942), *Abstr. Papers*, pp. 1A-27A).—The following, of interest to plant pathology, are included: Sulfur Dusting for Leaf-Spot Control—A Major Factor in Peanut Production, by L. I. Miller (pp. 9-10)

(Va. Expt. Sta.); and Cotton Diseases and Their Control, by R. F. Poole (p. 11) (Clemson Agr. Col.).

[Phytopathological work by the North Carolina Station] (*North Carolina Sta. Rpt. 1941*, pp. 31-32, 40-41, 46, 47, 48-49).—Brief reports are included on current experimental work, including peanut leaf spot control by Cu-S dusts, emergence improvement by seed treatment, and root, stem, and fruit decay associated principally with fungi; apple bitter rot control by split lime-sulfur and bordeaux spray program; leaf burn of blueberries caused by high S fertilizer; potato diseases in the State; lettuce damping-off (principally *Rhizoctonia*) control by Cu and Hg fungicides; tomato susceptibility to Granville bacterial wilt; and cucumber leaf disease control by Cu dusts.

[Plant disease work by the Vermont Station] (*Vermont Sta. Bul. 495* (1942), pp. 19-20, 30, 34-35).—Potato nutritional studies (particularly with P) in relation to leaf roll, by A. R. Midgley; proprietary spray materials for apple scab control, by M. B. Cummings and C. H. Blasberg; and the pathology of potato scab, and factors influencing the development of virus diseases in basic strains of seed potatoes, by B. F. Lutman, are noted.

Principales enfermedades parasitarias que fueron objeto de consulta en el primer semestre (enero-junio) de 1941 [Principal parasitic diseases of plants, January-June, 1941] (*Bol. Sanid. Veg. [Chile]*, 1 (1941), No. 1, pp. 79-82).—An annotated list.

Principales enfermedades no parasitarias que fueron objeto de consulta en el primer semestre (enero-junio) de 1941 [Principal nonparasitic diseases of plants, January-June, 1941] (*Bol. Sanid. Veg. [Chile]*, 1 (1941), No. 1, p. 83).—An annotated list.

Diseases of village crops in Ceylon, M. PARK and M. FERNANDO (*Colombo: Ceylon Govt. Press, 1941*, pp. vi+72, pls. 32).—This manual, written in relatively nontechnical language, is intended as a textbook and general reference work.

The virus: Life's enemy, K. M. SMITH (*Cambridge, Eng.: Univ. Press, 1941*, pp. viii+176, pls. 9, fig. 1).—In this semipopular account of the virus diseases of both plants and animals, the eight chapters are concerned with their discovery, methods of study, their nature, how they get about, the relationship between viruses and the insects which spread them, the virus and the living cell, important virus diseases, and their prevention and control. An appendix lists some important virus diseases, and an index is provided.

Progressos teóricos e práticos no campo da virologia [Theoretical and practical progress in the field of virology], K. SILBERSCHMIDT (*Bol. Soc. Brasil. Agron.*, 5 (1942), No. 1, pp. 78-83).—A review of recent virus research, with special reference to plant infections.

Influência da temperatura no desenvolvimento e frutificação do *Coryneum longistipitatum* Berl. et Bres. [Influence of temperature on the development and fruiting of *C. longistipitatum*], A. CORDEIRO ZAGALLO (*Agron. Lusitana*, 3 (1941), No. 2, pp. 121-127, pls. 2, figs. 2; *Ger. abs.*, pp. 126-127).—The conidia germinated in culture at 2°-28° C., with the optimum at 22°. At 29° no spores germinated, but they retained their power of germination up to 30°. At the optimum temperature 97.8 percent of the spores germinated after 9 hr., but the percentage decreased as the temperature was lowered from that point. The mycelium also grew best at 22°. The conidia were developed from 5° to about 22°, with optimum at 12°-14°. Below 5° and above 22° the mycelium remained sterile.

Notes on Oklahoma Cercosporae, II, W. W. RAY. (Okla. A. and M. Col.). (*Mycologia*, 34 (1942), No. 5, pp. 558-562).—Continuing the series (E. S. R., 85,

p. 357), descriptions are given for the following new leaf-infecting species: *Cercospora cocculicola* on *Cocculus carolinus*, *Cercospora kolkwitziae* on *Kolkwitzia amabilis*, *C. physocarp*i on *Physocarpus bracteatus*, and *C. corylina* on *Corylus rostrata*. A list of 20 species placed in the local herbarium is given.

Monilinia amelanchieris, E. E. HONEY. (Univ. Wis.). (*Mycologia*, 34 (1942), No. 5, pp. 575-578).—This is described as the perfect stage of *Monilia amelanchieris* pathogenic on species of *Amelanchier*.

Nuclear behavior in the Mucorales.—II, The *Rhizopus*, *Phycomyces*, and *Sporodinia* patterns, V. M. CUTTER, JR. (Cornell Univ.). (*Bul. Torrey Bot. Club*, 69 (1942), No. 8, pp. 592-616, figs. 21).—A continuation of the cytological study previously noted (E. S. R., 88, p. 310).

Two new chytrid genera, A. J. WHIFFEN. (Univ. N. C.). (*Mycologia*, 34 (1942), No. 5, pp. 543-557, figs. 52).—*Solutoparies pythii* n. gen. and sp. parasitizing *Pythium* sp. and *Septosperma rhizophidii* n. gen. and sp. parasitizing *Rhizophidium macrosporum* and *S. anomala* n. comb. are described.

Host-parasite relationship in a seed-borne disease of barley caused by *Helminthosporium sativum* Pammel, King, and Bakke, H. W. MEAD, (*Canad. Jour. Res.*, 20 (1942), No. 10, Sect. C, pp. 501-523, pls. 3, figs. 6).—A hulled barley kernel is a caryopsis enclosed by tightly adhering floral glumes. The testa, formed from the inner integument of the ovule, becomes increasingly resistant to fungi. Spikelets may become parasitized during flowering and afterwards by air-borne spores and mycelial fragments of *H. sativum*, which may cause blighting, shriveling, and discoloration of the spikelets and maturing kernels, the injury depending on the time of inoculation. Irregular dark thick-walled mycelium may become massed in the parenchyma of the glumes, pericarp, and lodicules, and ungerminated spores between the glumes and pericarp. This dormant mycelium remains viable for 2-5 yr., germinating when the kernel germinates and infecting the young tissues of the plumule and radicle as they expand and force their way through and past the infected tissues. It also colonizes the nearby soil to a limited extent. Embryo blight and pre- and postemergence blight with malformation, stunting, and lesioning of the seedling may follow infection, the amount of each depending on certain environal factors. There are 23 references.

Relation of loose smut to yield of barley, W. SEMENIUK and J. G. ROSS. (Univ. Minn. et al.). (*Canad. Jour. Res.*, 20 (1942), No. 10, Sect. C, pp. 491-500, figs. 3).—To study the effect on yields a simple technic was developed to inoculate barley with *Ustilago nuda*, and the infected seed lots were mixed in different proportions with normal seed to provide at least six levels of infection from zero to the maximum. No significant correlations were found in the 1939 trials, but in 1940 a direct linear relationship was obtained between the percentage incidence of loose smut and yield reduction. For every 1 percent increase in smut, yield was reduced 0.85 percent at St. Paul, Minn., 1.4 percent at Edmonton, and 1.2 percent at Fallis, Alta. Smut did not affect tillering noticeably. Similar infections were obtained at all stations for comparable seed lots, and higher infections were noted as the rate of seeding was increased. Smut incidence at Edmonton was the same on the basis of smutted spikes as on that of smutted plants.

Variation in reaction of Anthony oats to stem rust, *Puccinia graminis avenae*, I. W. TEVET and H. HART. (Minn. Expt. Sta. et al.). (*Phytopathology*, 32 (1942), No. 12, pp. 1087-1090, fig. 1).—In 1939 and 1940 many plants of the stem rust-resistant Anthony oats at Crookston, Minn., were found susceptible to stem rust, isolations from the pustules invariably giving race 5, which is common in the Mississippi Valley and one to which Anthony oats is usually

resistant. No morphological differences were found in susceptible and resistant plants of Anthony oats. Greenhouse attempts to render this variety susceptible to stem rust by varying the light, temperature, and moisture were unsuccessful, as also were field tests made with both major and minor fertilizing elements, in all cases about 15 percent of the plants becoming severely rusted. The progeny of seed from rust-susceptible plants were also susceptible. It is concluded that there are two strains of Anthony oats, indistinguishable morphologically and spectroscopically but differing in reaction to stem rust race 5, and that the lots of Anthony oats in use in Minnesota contain up to 15 percent of stem rust susceptible plants.

The production of grey speck of oats in purified sand cultures, R. H. HAGEMAN, J. S. MCHARGUE, G. D. SHERMAN, and E. S. HODGE. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 8, pp. 731-735, fig. 1).—Oats developed gray speck when grown in Mn-free sand culture. The chemicals used in unpurified nutrient salt solution contained sufficient Mn to prevent the trouble from becoming serious. Culture solutions containing 2 p. p. m. of Mn produced normal growths of oats. The gray speck produced on these sand cultures was identical with that occurring on Mn-deficient soil. There are 13 references.

Relative resistance of alfalfa species and varieties to rust caused by *Uromyces striatus*, J. M. KOEPFER. (Kans. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 12, pp. 1048-1057, figs. 4).—Using simple inoculating technic developed for obtaining heavy rust infection, laboratory, greenhouse, and field tests showed marked differences in the resistance of varieties and species of *Medicago* to *U. striatus*. *M. ruthenica* carried the highest form of resistance, while Turkestan and Hairy Peruvian proved most susceptible. A plant selection of Ladak exhibited the most resistance of any strains or varieties of the *M. sativa* group.

Treatment of sheared beet seed, L. D. LEACH. (Univ. Calif.). (*Sprckels Sugar Beet Bul.*, 6 (1942), No. 11, pp. 65, 68).—*Pythium* and *Rhizoctonia* were found effectively controlled on sheared seed by seed treatment with Ceresan or New Improved Ceresan, but other fungicides tested proved less satisfactory. Seed treatment failed to control water mold (*Aphanomyces*), but early planting avoided infection.

A study of the nature of resistance of dent corn to *Diplodia zeae* (Schw.) Lev. stalk rot, A. D. HOADLEY (*Md. Univ. Off. Pub.*, 39 (1942), No. 13, pp. 11-13).—An abstract.

La humedad de la semilla del algodónero relacionada con su poder germinativo y con la presencia del *Aspergillus wentii* [Moisture content of cottonseed in relation to germinability and the presence of *A. wentii*], M. A. DI FONZO (*Argentina Min. Agr., Junta Nac. Algodón, Bol. Mens.* No. 85-86 (1942), pp. 156-168, figs. 13).—The germinability of the seed was lowered and the pathogenicity of the fungus was increased by high moisture content. Control measures are suggested.

***Epichloe typhina* on imported fescue seed**, C. C. WERNHAM. (Pa. State Col.). (*Phytopathology*, 32 (1942), No. 12, p. 1093).—The author describes an outbreak of "choke" in fescue plantings originating from systemic infection of seed of *Festuca rubra genuina* and *F. rubra nemoralis* imported from Hungary in 1939.

Las enfermedades del lino [Flax diseases], G. GARCIA RADA ([Peru] *Min. Fomento, Dir. Agr. y Ganad., Informe* No. 54 (1942), pp. 11-19, pls. 4).—A brief conspectus including *Rhizoctonia* disease, pasmo, rust, wilt, and dodder, with control measures. All except wilt are illustrated in color.

La "fusariosis" o marchitamiento del lino en la Republica Argentina debida al "Fusarium lini" Bolley [**"Fusariosis" or wilt of flax in Argentina due to F. lini**], C. J. M. CARREIRA ([*Argentina*] *Min. Agr., Dir. Propag. y Pubs., Pub. Misc. No. 113* (1942), pp. 4, pl. 1).—An informative leaflet.

Breeding flax resistant to rust, A. C. DILLMAN. (U. S. D. A.). (*Oil, Paint, and Drug Rptr.*, 142 (1942), No. 17, pp. 3, 40B, fig. 1).—This note discusses the serious reductions of the 1942 crop from rust and the successful development of rust-resistant varieties of flax yielding high-quality oil by the North Dakota and Minnesota Experiment Stations. Seed of these varieties is being increased as rapidly as possible. Reference is also made to similar work at the Montana Station. In the meantime, recommendations are given on sanitary measures for use with the rust-susceptible Bison variety.

Compilation of results in control of potato ring rot in 1941, T. P. DYKSTRA. (U. S. D. A.). (*Amer. Potato Jour.*, 19 (1942), No. 9, pp. 175-196).—The results of the reports presented indicate that *Phytophthora septiconica* does not spread from hill to hill or from row to row. It may overwinter in tubers in the soil, but tests as to overwintering in the soil itself gave negative results in practically all cases. The outstanding effectiveness of $HgCl_2$ and acidulated $HgCl_2$ was confirmed, and iodine was almost as effective in disinfecting cutting knives, whereas nearly all other chemicals tried were unsatisfactory. Boiling water at 5, 10, and 15 sec. exposures gave good results and offers possibilities for ring rot control. Some of the best results in controlling spread between healthy and infected seed pieces followed use of $HgCl_2$ (1-500). Acidulated $HgCl_2$ and Cinnex Special also gave very satisfactory control. Injury to seed pieces from these treatments varied from serious to practically none. Many disinfectants used as sprays gave highly satisfactory results in disinfecting pieces of wood contaminated with the pathogen, but fumes of the chemicals tested were mostly ineffective. The ultraviolet method of detecting infected tubers continued to give satisfactory results but must be operated under proper conditions.

Potato scab in relation to calcium, soil reaction, and the use of acid-forming and non-acid-forming fertilizers, H. T. COOK and T. J. NUGENT (*Virginia Truck Sta. Bul. 108* (1942), pp. 1783-1795).—Scab index data analyzed on the basis of kind of fertilizer used indicated that in 3 or 4 yr. significantly more scab developed on potatoes from plats treated with non-acid-forming than with acid-forming fertilizers. This result is accounted for by the fact that most of the samples from acid-forming fertilizer plats had soil reactions unfavorable to scab, whereas the reverse was true for the non-acid-forming fertilizer plats. Divided on the basis of soil reaction there was a significantly larger amount of scab on potatoes from sections of plats with higher soil reactions (pH) than from those with lower reactions. This relationship was found when samples from both acid-forming and non-acid-forming fertilizer plats were analyzed together, as well as when analyzed separately according to kind of fertilizer. Addition of extra Ca to the soil as gypsum caused no important change in soil reaction or significant differences in amount of scab with either type of fertilizer. It is concluded that the amount of scab is closely correlated with soil reaction and only indirectly with fertilizer reaction or its Ca content to the extent that the fertilizer may change the soil reaction. It is also concluded that Ca has no effect on scab development and that Ca compounds affect it only to the extent that they may change the soil reaction. Concrete fertilizer recommendations are given. There are 25 references.

Sample size and reliability, D. FOLSOM. (Maine Expt. Sta.). (*Amer. Potato Jour.*, 19 (1942), No. 9, pp. 197-199).—Potato tubers are sometimes planted in the greenhouse and in the South to determine as early as possible how much

virus disease is present in the seed stock represented. The larger the number of tubers used, the more reliably will they forecast the disease incidence in future field plantings, but increasing the number of samples also increases the cost of the tests. The decision as to the best compromise between reliability and expense may be made easier by the availability of a table presented which shows the minimum sample size that may be expected to give reliability of a certain degree. The use of such a table is explained in detail.

The pathogenicity and genetics of some sorghum smuts, S. VAHELDUDDIN (*Minnesota Sta. Tech. Bul.*, 154 (1942), pp. 46, pls. 6, figs. 4).—Since there are four smut fungi attacking sorghum, it seemed desirable to ascertain to what extent new biotypes might arise in nature as a result of intraspecific and interspecific or intergeneric hybridization.

A study of *Sphacelotheca sorghi* revealed it to comprise a great many haploid biotypes differing in sex and culture characters. The 74 haploid derivatives from 28 chlamydospores grouped themselves into about 16 types on the basis of culture characters, and there were apparently at least 60 sex groups among them as determined by the Bauch test. When haploid lines were sexually compatible, they hybridized freely and produced new morphologic and physiologic types. Peridial color and color of smutted heads appear to be due to genetic factors. When monosporidial lines from chlamydospores obtained from brown heads were crossed the smutted heads were brown, and when the brown \times brown crosses were continued to the sixth generation only brown heads appeared. However, when haploid lines from chlamydospores of the gray type were crossed two types of heads resulted, brownish gray and gray. When a brown \times gray cross was made the F_1 head type was brownish gray, and crosses between haploid lines therefrom produced brown, brownish-gray, and gray head types. Of the three possible explanations of this situation, the most likely is believed to be that the factors for brown and gray in brown \times gray dicaryophytes may have been so delicately balanced as to account for considerable variation in the color.

Conclusive evidence was obtained that dicaryophytes with different pathogenic capabilities may arise as a result of the union of haploid lines, and it is thus well to be prepared for changes in varietal resistance. It was found for *S. sorghi* that early planting, when soil temperature is likely to be low, tends to decrease the amount of smut. In 2-yr. tests of a large number of fungicides it was completely controlled by seed treatment with New Improved Ceresan, and Ceresan, Koppers "Flotation" sulfur, wettable sulfur, powdered flowers of sulfur, gas sulfur, and Kolo dust were also effective without seed injury in any case.

When 5 haploid lines of *S. cruenta* were paired with 7 haploid lines of *Sorosporium reilianum* in 18 combinations, all of them produced infection and the hybrids were fertile. Some of the F_1 sori resembled one parent, others the other, and some were intermediates, but, most remarkable, there were a number resembling those caused by *Tolyposporium filiferum* and accompanied by pronounced hypertrophy of the affected host tissues. The F_1 chlamydospores were intermediate between those of the parents but germinated at high temperatures better than those of either, in this respect also resembling *T. filiferum*. There was marked evidence of heterosis in promycelia, sporidia, and hyphal branches from the promycelia. The promycelia and sporidia of the hybrid were much larger than for the parents. Furthermore, some of the haploid lines from F_1 chlamydospores tolerated ammonium phosphate far better than any of those of the parents. Studies of the F_2 generation substantiated, in general, the findings for F_1 .

The results show clearly that there are many freely interbreeding haploid biotypes within the species of sorghum smuts studied and that hybridization between biotypes of different genera can take place readily. Different morphologic types of smut sori and dicaryophytes differing in pathogenicity may result; consequently, hybridization may have far-reaching implications in the taxonomy and pathogenicity of these fungi.

New fungicides and reduced fungicide dosages for the control of kernel smut of sorghum, R. W. LEUKEL. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 12, pp. 1091-1093).—In replicated tests at seven stations (1942), Spergon, Thiosan, Dubay 870, and morpholine thiuram disulfide improved the emergence and controlled kernel smut in Sharon kafir when applied at 3, 1.5, or 0.75 oz. per bushel. Captax proved effective at the 3-oz. dosage, but Sanosed was relatively ineffective. Smut in the controls ranged from 7.8 to 43.4 percent.

Quantitative measurement of a strain of tobacco-etch virus, F. O. HOLMES (*Phytopathology*, 32 (1942), No. 12, pp. 1058-1067, figs. 3).—Under some enviroinal conditions, conspicuous necrotic primary lesions were produced in leaves of *Physalis peruviana* 5-10 days after inoculation with the severe-etch strain of the virus. Assaying this virus by using the number of lesions resulting from each inoculation as an index of infectivity, several hosts were compared as potential virus sources, *Nicotiana glutinosa* apparently being the best among them. Tobacco and tomato furnished less infective extracts but were fairly satisfactory sources 10 days after initial inoculation. Virus activity in expressed juices of tobacco reached a maximum about 10 days after inoculation and then rapidly declined. Severe-etch virus withstood drying for at least 10 days in juice samples or diseased leaves, although in both cases there was a reduced infectivity with time. It retained activity well for at least 10 days in acid-buffer solutions at pH 4.5-6 held just above or just below freezing. It retained some infectivity after heating for 10 min. at 53° C., but was completely inactivated in 10 min. at 55°; it was still viable to some extent after 30 min. at 51°, but was wholly inactivated at 53° for 30 min. There are 21 references.

Vegetable diseases in Nebraska, J. E. LIVINGSTON (*Nebr. Agr. Col. Ext. Cir.* 1801 [1942], pp. 36, figs. 15).—A general account.

1942 vegetable diseases as affected by the weather (*New Jersey Stas. Plant Disease Notes*, 20 (1942), No. 6, pp. 23-26).—Notes are presented relative to weather effects on tomato defoliating diseases, anthracnose, and shoestring disease; bacterial blight of lima bean; and *Helminthosporium* blight of sweet corn.

Notas sobre une doenç de virus em feijão de porco (*Canavalia ensiformis*, D. C.) e outra em feijão comum (*Phaseolus vulgaris* L.) [Notes on virus diseases of Chickasaw lima bean and of common bean], K. SILBERSCHMIDT and N. R. NORREGA (*Biologico*, 8 (1942), No. 5, pp. 129-133, pls. 2; *Eng. abs.*, p. 133).—The disease of *C. ensiformis*, characterized by interveinal chlorosis and vein-banding of young leaves and a mosaic pattern without blistering, was transmitted by sap inoculations to healthy plants of this host as well as to *Soja* sp., sweet pea, and garden pea, but not to several other leguminous and solanaceous species tested. The bean disease, exhibiting mosaic patterns on young and medium leaves and slight wrinkling and savoying of older leaves, was transmitted in the same way to certain varieties of bean and pea but not to other varieties or to cowpea.

1942 sweet corn hybrid tests (*New Jersey Stas. Plant Disease Notes*, 20 (1942), No. 7, pp. 27-30).—Further variety and hybrid comparisons (E. S. R., 87, p. 815) are discussed and tabulated with reference to their reactions to bacterial wilt and smut.

Diseases of greenhouse cucumbers, L. W. KOCH (*Canada Dept. Agr. Pub.* 741 (1942), pp. 12, figs. 5).

Doenças das sementeiras da cebola [Seed-bed diseases of onions], O. A. DRUMMOND (*Ceres [Minas Geraes]*, 3 (1942), No. 16, pp. 251-258, pls. 2).—Anthraxnose and other diseases and their control are considered.

Spinach wilt caused by *Fusarium* sp. (*New Jersey Stas. Plant Disease Notes*, 20 (1942), No. 5, pp. 19-22).—This disease, reported to have been gradually increasing in incidence in northern New Jersey during recent years, was found limited to fields continuously in spinach and to be largely dependent on seasonal conditions. The above-ground and root symptoms are described. Pending further research, indirect control measures are suggested.

Control of diseases attacking vegetable crops, R. S. KIRBY. (Pa. State Col.). (*Veg. Growers Assoc. Amer. Ann. Rpt.*, 1940, pp. 173-187).—A brief conspectus for the principal tomato diseases.

Control of spotted wilt of tomatoes, C. J. MAGEE, W. L. MORGAN, and A. N. JOHNSON (*Jour. Austral. Inst. Agr. Sci.*, 8 (1942), No. 3, pp. 115-117).—Spraying the plants with tartar emetic bait greatly reduced the number becoming infected in the two series of treated plats reported upon. These results were supported in tests by commercial growers, and paris green also showed promise.

A ring-spot type of virus disease of tomato, R. W. SAMSON and E. P. IMLE (Ind. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 12, pp. 1037-1047, figs. 2).—This disease, found in field and garden plantings throughout Indiana, is characterized by intricate patterns of necrotic rings and sinuous lines on young leaves, streaks on the stems, and concentric, brown, necrotic rings on the fruit. Infected tomato plants outgrow the necrotic phase and subsequently show either no detectable symptoms or only a vague mottling, but the virus is still present in the symptomless parts. Transmission tests with *Thrips tabaci* were unsuccessful and inconclusive. In the greenhouse development is more rapid and destructive at 80° than at 70° or 62° F. The susceptibility of 78 species in 27 families was tested, disease symptoms being produced on 2 species of the Amaranthaceae, 1 of the Martyniaceae, and on 19 species and varieties of the Solanaceae. It was recovered, by return inoculation to jimsonweed and tomato, from *Amaranthus tricolor* and from 16 species and varieties of the Solanaceae. Studies of the properties of the virus in tomato-plant extract are reported. Differences in symptoms, host ranges, and properties clearly indicated that the tomato ring spot virus is distinct from those of tobacco ring spot and potato ring spot and ring mosaic. The symptoms on tomato are highly suggestive of those produced by the spotted wilt virus, but it has a more restricted host range and a higher thermal death point. Tomato plants affected with tomato ring spot were not protected from infection by a suspected culture of the spotted wilt virus.

Resistance of watermelon to the wilt disease, A. E. BRAUN. (Univ. Idaho). (*Amer. Jour. Bot.*, 29 (1942), No. 8, pp. 683-684).—In this study more acetic acid was found in the Citron, a variety of watermelon less susceptible to *Fusarium oxysporum niveum*, than in the Kleckley Sweet, a more susceptible variety. Further investigations, however, will be needed to prove definitely that the acetic acid is the basis of resistance.

Algunas enfermedades de las plantas en la zona frutera de Boyacá [Some diseases of the fruit zone of Boyacá], R. OBREGÓN BOTERO (*Rev. Facult. Nac. Agron. [Colombia]*, 5 (1942), No. 19, pp. 594-633).—Special consideration is given to diseases of apple and peach and their control, including listings of varieties found resistant.

An apple rot fungus morphologically related to a human pathogen, L. P. MCCOLLOCH. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 12, pp. 1094-

1095).—The author's study of the apple-rotting fungus *Sporotrichum malorum* resulted in its transfer to *Phialophora malorum*. *S. carpogonium* is considered synonymous with *P. malorum* and treated as a strain of that species. The apple-rotting fungus aligns itself with the form-genus *Phialophora*, strictly in a morphological sense.

Boron deficiency in pear trees, J. R. KIENHOLZ (*Phytopathology*, 32 (1942), No. 12, pp. 1082–1086, fig. 1).—Boron applications to the soil around pear trees corrected a condition characterized by fruit pitting, especially near the calyx end, and by superficial cankers on younger branches. Without treatment, dieback of twigs follows and the trees gradually die. On fruit the symptoms resemble those of the virus-induced stony pit. It is suggested that the pear disease variously termed "crinkle," "bitter pit," and "internal cork" in Australasia is the same as stony pit. Black end of the fruits, attributed to stock and scion relations, was not corrected by boron.

Peach twig blight hits orchards hard, O. T. McWHORTER. (Oreg. State Col.). (*Better Fruit*, 37 (1942), No. 4, p. 3).—A note on the epidemic proportions of twig blight and brown rot in unsprayed orchards (1942), with production of clean fruit where recommended precautions were carried out.

The effect of certain added materials on bordeaux mixture in the control of peach blight and leaf curl, E. E. WILSON (*Hilgardia* [California Sta.], 14 (1942), No. 9, pp. 491–515, figs. 3).—For adequate protection of peach trees against attack by *Coryneum beijerinckii* the twigs must be protected by a fungicide weather-resistant throughout the winter. Used in sufficient amounts, a dormant-type petroleum oil was found to increase the tenacity of bordeaux and its resultant control of blight. Neither bentonite nor cottonseed oil appeared to affect the tenacity of bordeaux or its control of twig infection. None of the added materials affected the efficiency of bordeaux for control of leaf curl (*Taphrina deformans*), a single fall application, with or without supplements, effectively reducing the disease.

In laboratory tests, with a constant volume of spray applied by an atomizing apparatus onto vertical surfaces of cellulose nitrate, when bordeaux and bordeaux plus 3 percent of oil emulsion were applied until the liquid showed signs of running down the surface the latter mixture deposited an average of 37 percent more Cu. With both types of bordeaux the deposit was greater at the runoff than at the drip stage. As to the length of time to produce runoff, oil-bordeaux was found to require the longer period. On coming in contact with a surface during application, the area covered by the spray droplets was largely determined by the wetting properties of the liquid. Since bordeaux wetted the surface somewhat better than oil-bordeaux, the droplets of this material occupied the larger area. As fewer were required to cover the surface, less bordeaux than oil-bordeaux was required to produce runoff and hence less was retained by the surface. When application was prolonged until liquid had drained from the surface and the retained precipitate was dried, the oil-bordeaux was found more evenly distributed than the bordeaux. An apparent explanation is given. Though inadequate to explain the different problems encountered in the field, these laboratory results contain suggestions that would account for wide variabilities in deposits between years, or among applications made by different individuals.

In laboratory comparisons of the two types of bordeaux to spores of *C. beijerinckii* and *Sclerotinia fructicola*, those at 8–8–100, with and without oil, were of such uniformly high toxicity as to be indistinguishable in this respect, but when successive dilutions were made bordeaux appeared somewhat more toxic than oil-bordeaux. Another assay method consisting in germination of the spores in elongated drops of water, placed on slides with one end of the drop resting

over a dried film of the fungicide and the other extending over clean glass, gave similar results. In artificial weathering tests 2 percent or more of oil emulsion was found to reduce the loss of Ca and sulfate from dried bordeaux films. In tests of wash water from weathered bordeaux and oil-bordeaux films more soluble Cu was found to escape from the latter, but it was determined that most of the soluble Cu was held by oil which escaped during weathering. Oil extracted from thoroughly dried oil-bordeaux films by anhydrous ether contained considerable amounts of soluble Cu, but the presence of this oil-held soluble Cu did not appear to increase markedly the toxicity of the wash water to fungus spores.

Diseases of small fruits in Idaho, E. C. BLODGETT (*Idaho Sta. Bul.* 246 (1942), pp. 27, figs. 20).—This is a conspectus of parasitic (including virus) and nonparasitic diseases of brambles, bush fruits, grapes, and strawberries, with control measures.

Blueberry cane canker, J. D. DEMAREE and M. S. WILCOX. (U. S. D. A.). (*Phytopathology*, 32 (1942), No. 12, pp. 1068-1075, figs. 3).—This disease is said to be of considerable economic importance in the southeastern United States, having been observed in cultivated plantings in Alabama, Florida, Georgia, Mississippi, and North Carolina, and in wild blueberries in Florida and North Carolina. The evidence shows the causal fungus (*Phylospora corticis* n. sp.) to be indigenous on wild blueberries in the South and to have spread from them to cultivated plantings.

Seca dos galhos da figueira [Fig canker], O. A. DRUMMOND (*Ceres [Minas Geraes]*, 3 (1941), No. 15, pp. 162-164, pls. 2; *Eng. abs.*, p. 164).—This serious disease due to *Phomopsis cinerascens* found attacking fig branches in Brazil is described. This is believed to be the first report from America.

Yeasts occurring in souring figs, E. M. MRAK, H. J. PHIAFF, R. H. VAUGHN, and H. N. NANSEN. (Univ. Calif.). (*Jour. Bact.*, 44 (1942), No. 4, pp. 441-450).—Of the 115 yeasts isolated from 3 varieties of souring figs most were *Saccharomyces* or *Candida* species (listed and discussed). Others included were species of *Pichia*, *Zygopichia*, *Hanseniaspora*, *Kloeckera*, *Torulopsis*, *Zygosaccharomyces*, *Hansenula*, and a new species of *Debaryomyces*. The sugar tolerance of the organisms was low, most of them growing in 40° but not in 50° Ball. fig sirup. Volatile and fixed acid production was low and insufficient to cause the spoilage termed souring. Evidence is presented to show that adaptive lactase formation occurs in organisms termed *S. fragilis*. Most of the fig souring appears to result from the associative action of yeasts and acetic acid bacteria. There are 24 references.

A diagnose de deficiências nutritivas na oliveira pela injeção de soluções salinas [Diagnosis of nutritive deficiencies in the olive by injecting saline solutions], P. J. DE ALMEIDA (*Agron. Lusitana*, 3 (1941), No. 1, pp. 59-70, pl. 1, fig. 1; *Eng. abs.*, pp. 69-70).—Because of the low negative pressure of the sap, injection trials proved difficult to carry out and were limited to experimental conditions. By methods described KNO_3 , K_2HPO_4 , and $NH_4H_2PO_4$ were used, but the volume of liquid absorbed was very small. In these preliminary tests branches supplied with N in the form of ammonia yielded more normal fruits of large size and with more pulp. On the same branches a large proportion of the fruits failing to develop normally took on a rounded form and remained longer on the trees.

Notas sobre o Gloeosporium olivarum Alm., R. V. DE GARCIA CABRAL (*Agron. Lusitana*, 3 (1941), No. 1, pp. 49-58, pls. 2, figs. 2; *Eng. abs.*, pp. 56-57).—*G. olivarum* causes a widespread disease of olive fruits which seriously affects the crop, in some years causing almost total failure. The disease appears on fully developed fruits or those approaching maturity and shows up as sunken areas covered by tiny orange to orange-brown acervuli; later the fruits become wrinkled

and are easily shed. Successful inoculations were made on cultivated and wild olive fruits, but not on leaves, petioles, twigs, or branches. The incubation period was shorter on mature than on unripe or green stages of the fruits. The fungus grows rapidly, its optimum temperature being 26° C. Between 22° and 27° spore production was abundant in culture.

Phytophthora cinnamomi and wet soil in relation to the dying-back of avocado trees, V. A. WAGER. (Coop. Calif. Citrus Expt. Sta.). (*Hilgardia* [California Sta.], 14 (1942), No. 9, pp. 519-532, figs. 3).—Dying-back or decline of avocados in southern California appears to be commonly associated with excessive moisture. The roots are frequently blackened and dead, and the larger ones may exhibit brown lesions. *P. cinnamomi* and *Pythium vexans* were commonly isolated from such roots. The first had previously been recorded from avocados only in South Africa and Puerto Rico. Inoculation tests indicated that if the plants were watered normally *Phytophthora cinnamomi* could be present in the soil for at least 6 mo. without serious effect, but if the roots and soil were flooded or submerged for 1-3 days the fungus caused root injury followed by rapid wilting and death of the plants. Controls without the fungus could withstand such flooding for as long as 9 days without subsequent harm. Results of tests with *Pythium vexans* indicated that it does not injure the roots, probably growing only in weakened or dead tissues or in those already attacked by *Phytophthora cinnamomi*.

Enfermedades del banano [Banana diseases], J. R. JOHNSTON (*Rev. Agr. y Com.* [Panama], 2 (1942), No. 8, pp. 15-16).—A brief note on banana wilt (*Fusarium cubense*) and other diseases.

Witches' broom disease investigations.—II, Notes on the susceptibility of I. C. S. selections at River Estate to witches' broom disease of cacao, R. E. D. BAKER and S. H. CROWDY (*Trop. Agr.* [Trinidad], 19 (1942), No. 11, pp. 207-209).—A continuation (E. S. R., 86, p. 203). The observations here reported were obtained from young trees and no account was taken of pod resistance.

Early diagnosis of magnesium deficiency in Florida citrus, B. R. FUDGE. (Fla. Expt. Sta.). (*Citrus Indus.*, 23 (1942), No. 9, pp. 1, 4-5, 14, figs. 4).—When the first visible symptoms of Mg deficiency appear in grapefruit foliage it is too late to apply Mg fertilizers to trees for prevention of further development of severe deficiency conditions. The experimental data presented definitely indicate that it is possible to determine by chemical analysis of the new spring foliage the probability of the occurrence of Mg deficiency 4-5 mo. later, and it should be possible by amending any deficiency indicated by the spring analysis to prevent the impending development of further symptoms. The practical use of this information is limited by the lack of a reliable quick method for Mg determination. Probably the most important practical point contained in the results relates to the incorporation of Mg in mixed fertilizer on a unit basis in what may be considered a maintenance program that will control Mg deficiency in the tree.

Tizon gomoso de las ramitas de los citrus [Brown rot gummosis of citrus], H. A. SPERONI ([Argentina] *Min. Agr., Dir. Propag. y Pubs., Pub. Misc. No. 114* (1942), pp. 4, pls. 2).—This is a brief account of the disease as it occurs in Argentina on citrus fruits and branches (illustrated in color), with suggested control measures. *Phytophthora citrophthora* and *P. parasitica* were the principal fungi encountered.

Phytophthora root rot of citrus, L. FRASER (*Jour. Austral. Inst. Agr. Sci.*, 8 (1942), No. 3, pp. 101-105, figs. 3).—Following a brief historical account of gummosis and foot rot of citrus, the author discusses *P. citrophthora*-induced collar rot, foot rot, and root rot in New South Wales and varietal reactions to the pathogen.

Pythiaceous fungi on citrus, V. A. WAGNER. (Coop. Calif. Citrus Expt. Sta.). (*Hilgardia* [California Sta.], 14 (1942), No. 9, pp. 535-548, figs. 2).—Cultures from fibrous dead roots of orange and lemon trees in various southern California localities exhibiting a dying-back or decline yielded *Pythium ultimum*, *P. debaryanum*, *P. vexans*, *P. rostratum*, *Phytophthora citrophthora*, and *P. parasitica*, the first being most frequent and the last very infrequent as compared with *Fusarium solani*, which was found on almost every root. Inoculations on orange and lemon fruits with the *Pythium* species listed, with *P. irregulare*, and with all the *Phytophthora* species that have been isolated from citrus (*P. citrophthora*, *P. parasitica*, *P. palmivora*, *P. syringae*, *P. cactorum*, *P. cinnamomi*, and *P. megasperma*) are reported upon. The distribution of the *Phytophthora* species and descriptions of the morphological characters of the *Phytophthora* and *Pythium* species which have been recorded on citrus are given.

Infecções perenais da *Tranzschelia pruni-spinosae* Pers. na *Anemone coronaria* [Perennial infection of *A. coronaria* with *T. pruni-spinosae*], B. D'OLIVEIRA and M. DE L. V. BORGES (*Agron. Lusitana*, 3 (1941), No. 1, pp. 71-77; *Eng. abs.*, p. 76).—Infected corms planted early in the fall gave rise to a large number of leaves during winter, but the rust did not appear until late in March. The first signs were the appearance of pycnia on the lower margins of the leaves; aecia developed only on later formed leaves. The mycelium infecting the corms was always uninucleated, the binucleated condition occurring only on the green parts. By breaking the corms into small pieces, each with one bud, it was possible to obtain plants infected with one sex only. Kept free of insects, these infections developed pycnia and sterile aecia. By inoculating such plants with spermatia from different sources of sterile rust it became possible to induce fertilization, thus showing that the rust is heterothallic. Temperature apparently controls development of the rust, 34° C. for 4 days providing sufficient to kill the fungus without harming the host plant.

Bulb rot diseases of lilies, E. P. IMLE. (Cornell Univ. et al.). (*Amer. Lily Yearbook*, 1942, pp. 30-41, figs. 10).—A brief conspectus of diseases of bulbs while developing in the soil, including control.

Um vírus das Liliáceas em Portugal [A virus of the Liliaceae in Portugal], M. DE L. D'OLIVEIRA (*Agron. Lusitana*, 3 (1941), No. 2, pp. 115-120, pl. 1; *Eng. abs.*, p. 119).—A virus disease of onions is reported to have occurred in the vicinity of Lisbon since 1939, the symptoms being those of the American "yellow dwarf" and the German "Gelbstreifigkeit." Using the carborundum-leaf rubbing method, the disease was transmitted to a low percentage of inoculated plants. Other local spontaneous hosts included *Muscari comosum* and *Narcissus tazetta*. In view of the methods of onion culture prevailing, it is not believed that the disease will become widespread in Portugal.

Severity of narcissus basal rot increased by the use of synthetic hormones and bases, N. W. STUART and W. D. MCCLELLAN. (U. S. D. A.). (*Science*, 97 (1943), No. 2505, p. 15).—A preliminary report on increased severity of bulb infection and stimulation of growth of the fungus *Fusarium oxysporum narcissi* in culture by various growth substances and nitrogen bases.

Insect transmission of the virus causing narcissus mosaic, F. S. BLANTON and F. A. HAASIS. (U. S. D. A. and [N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 9, pp. 413-419).—Among all the insects collected from field-grown narcissus plants and tested experimentally, the following aphids transmitted the narcissus mosaic virus: *Macrosiphum solanifolii*, *M. rosae*, *M. pisi*, *Aphis rumicis*, *Myzus convolvuli*, *M. cerasi*, and *Anuraphis roseus*. These aphids transmitted the virus to 904 of 1,558 plants of the varieties Sir Watkin, King Alfred, Minister Talma, Spring Glory, and Victoria. Miscellaneous

insects and mites, including five species of leafhoppers, two of thrips, one of springtails, and two of mites gave negative results. There are 14 references.

The aerosol-hypochlorite technique for the sterilization of orchid seeds, H. CASTLE and L. G. NICKELL (*Amer. Orchid Soc. Bul.*, 11 (1942), No. 6, pp. 200-201).—Although this note deals primarily with the detailed technic of sterilizing and sowing orchid seeds, a suggestion regarding choice of culture medium is included. The method as described was developed in connection with studies on the germination of orchid seeds, but it is believed it could be applied with success in the sterilization of spores and other minute resting reproductive bodies.

Phytopomonas poinsettiae n. sp., the cause of a bacterial disease of poinsettia, M. P. STARR and P. P. FIRONE. (N. J. Expt. Stas. et al.). (*Phytopathology*, 32 (1942), No. 12, pp. 1076-1081).—The authors describe a serious disease of *Euphorbia pulcherrima*, proved due to *P. poinsettiae* n. sp. It is recommended that this species be included in the *Corynebacterium* group of phytopathogenic bacteria.

Hybrid rose understock resistant to nematode (*Amer. Nurseryman*, 76 (1942), No. 8, p. 21).—A note on the resistant understock *Rosa multiflora* × *R. blanda* developed by the Iowa Experiment Station and its performance in Texas.

Damage to catalpa due to recreational use, D. J. WEDDELL. (Univ. Ga.). (*Jour. Forestry*, 40 (1942), No. 10, p. 807, fig. 1).—A note on cankers associated with the catalpa worm (*Ceratonia catalpae*) and the fungus *Hypoxyton rubiginosum*, arising from bark injuries.

The effects of various concentrations of boron on the growth of pine seedlings in water culture, W. V. LUBBROOK (*Jour. Austral. Inst. Agr. Sci.*, 8 (1942), No. 3, pp. 112-114).—The growth rate of *Pinus radiata* seedlings in water culture increased with the concentration of B in nutrient solution up to a concentration of 0.05 p. p. m. of added B, but concentrations of 0.5 p. p. m. and over gave no further increases. Marked deficiency symptoms developed at 0.005 p. p. m. of added B and very slight symptoms at 0.01 p. p. m., but none occurred in solutions containing 0.05 p. p. m. or over. Toxicity symptoms developed in older seedlings grown in solutions containing 10 p. p. m. or over, but not in those containing 5 p. p. m. or less. Needles of B-deficient seedlings tended to contain less starch than those receiving adequate supplies, but there was no obvious difference in chlorophyll content.

White pine blister rust control policies in New York State, H. L. MCINTYRE. (U. S. D. A. et al.). (*Jour. Forestry*, 40 (1942), No. 10, pp. 782-785).

Blister rust control in Washington State (*Jour. Forestry*, 40 (1942), No. 10, pp. 806-807).

Fused needle disease of pines, W. NELSON-JONES (*Empire Forestry Jour.* [London], 20 (1942), No. 2, pp. 151-161, pls. 2).—The occurrence of fused needle disease is reported in England on Corsican pine, Mountain pine, and Scots pine, species not hitherto recorded as susceptible. Observations and experiments indicated that recovery occurs immediately by providing conditions favoring short root production and establishment of a normal mycorrhizal system, that the incidence of the disease is associated with the arrest of short root development and mycorrhiza formation rather than with consistent poverty of mycorrhizas, that it is not transmitted by grafting nor is it due to Zn or B deficiency, and that the degree of incidence is reduced by phosphatic dressings, probably as a result of direct stimulation of fungus activity. A new hypothesis is presented in which appearance of the disease is ascribed to a sudden water shortage at the time the leaves are beginning to expand, the deficiency arising from greatly reduced root absorption owing to failure of the root system to provide functional

short roots and mycorrhizas at this critical period of the life cycle. Careful studies of the distinct phases of growth associated with root and shoot activity in different pine species and the effect of disturbance of normal correlations in this respect are called for to determine how far the arrest of short root development and mycorrhiza formation observable in all pine trees showing symptoms of fused needle is responsible for the development of such symptoms. The work of others is discussed (14 references).

Willow blight in West Virginia, J. A. RUPERT and J. G. LEACH. (W. Va. Expt. Sta.). (*Phytopathology*, 32 (1942), No. 12, pp. 1095-1096).—It is shown by inoculation that this disease, apparently spreading from infected ornamental plantings to native willows, is due primarily to *Physalospora miyabeana*. *Fusicladium saliciperdatum*, though universally present in young lesions, appeared to be of secondary importance only. Old lesions were sometimes invaded by *Macrophoma* sp., considered a secondary saprophyte.

Fungi associated with typical truewood decays observed in Victorian forest trees, G. PARKIN (*Austral. Forestry*, 6 (1942), No. 2, pp. 82-86).—In this study the fungi causing decay in 23 different specimens of wood were established and the results are tabulated and discussed, with the conclusion that a particular type of decay may be caused by any one of the several fungi associated and, vice versa, that one fungus does not necessarily produce only one type of decay.

Longevity of the spores of some wood-destroying Hymenomycetes, C. H. HARRISON (*Phytopathology*, 32, (1942), No. 12, pp. 1096-1097). The spore longevity of six fungi was determined by suspending the spores in sterile water, streaking on agar slants, and observing for growth with a 10 × hand lens.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Biology handbook (U. S. Dept. Agr., Soil Conserv. Serv., 1942, [Region 5], pp. [6]+73, [pls. 12]).—This handbook is intended as an aid in the production of wildlife on 33 million acres of wasteland, so called because it cannot be more intensively used without waste and is properly designated wildlife land. It takes up the objectives and planning procedures (pp. 1-4), importance of animal life to agriculture (pp. 5-14), essential requirements of wildlife (pp. 15-16), wildlife conservation practices (pp. 17-12), establishment of conservation practices (pp. 43-60), and control of wildlife damage (pp. 61-68). A list of co-operating State and Federal agencies and of 50 references to the literature cited and a subject index are included.

The mole, its life-history, habits, and economic importance, R. S. MACDOUGALL. (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 54 (1942), pp. 80-107, figs. 8).

Rabbit raising, G. S. TEMPLETON, F. G. ASHBROOK, and C. E. KELLOGG (U. S. Dept. Int., Fish and Wildlife Serv., Conserv. Bul. 25 (1942), pp. II+63, figs. 35).—This supersedes Farmers' Bulletin 1730 (E. S. R., 72, p. 375).

The animal parasites of the fox squirrel (*Sciurus niger rufiventer*) and the gray squirrel (*Sciurus carolinensis carolinensis*), J. UHRICH and E. GRAHAM (*Anat. Rec.*, 81 (1941), No. 4, Sup., p. 65).—Examination of 100 fox squirrels from southeastern Kansas resulted in the finding of the following parasites: *Eimeria* sp. in 65 percent; an unidentified sporozoan 1; an unidentified amoeba 1; *Catenotaenia* sp. 2; cysts of *Taenia pisiformis* 1; *Heligmodendrium hassalli* 15; *Trichostrongylus calcaratus* 7; *Rictularia* sp. 1; *Ascaris* sp. 1; *Hoplopyllus affinis* and *Orchopeas wickhami* 63; *Neohaematopinus sciurinus* 47;

Dermacentor variabilis 7; an itch mite, family Sarcoptidae, 1; and *Trombicula* sp. and *Atricholaelaps glasgowi* in 15 percent.

A survey of the endoparasites of the digestive and respiratory tracts of the Hungarian partridge (*Perdix perdix perdix* Linn.) in Whitman County, Washington, L. BRUGGER. (Wash. State Col.). (*Anat. Rec.*, 81 (1941), No. 4, Sup., p. 134).—The examination of 104 partridges collected between October 1940 and September 1941 revealed an incidence of 3.9 percent of *Heterakis gallinae*. Protozoan parasites were not found. Check specimens of Chinese pheasants (*Phasianus colchicus torquatus*) and bobwhite quail (*Colinus virginianus texanus*) showed both *H. gallinae* and species of *Eimeria*.

Breeding woodcock populations, A. T. STUDHOLME and R. T. NORRIS. (Pa. Expt. Sta. et al.). (*Auk*, 59 (1942), No. 2, pp. 229-233).

Food of toads in Oklahoma, C. C. SMITH and A. N. BRAGO (*Anat. Rec.*, 81 (1941), No. 4, Sup., p. 111).—Report is made of the findings in the stomach contents of several hundred toads representing *Bufo americanus americanus*, *B. cognatus*, *B. compactilis*, and *B. woodhousii woodhousii*.

The fauna of forest-humus layers in New York, T. H. EATON, JR., and R. F. CHANDLER, JR. ([New York] Cornell Sta. Mem. 247 (1942), pp. 26, figs. 2).—The primary mechanical factors in converting forest litter to the organic portion of humus layers are apparently arthropods and earthworms. Fine mull and the mor humus layers consist largely of fecal material, while coarse mull in northeastern second-growth hardwood forests consists largely of mixed organic and mineral matter which has passed through earthworms or associated arthropods. There appeared to be no distinct faunal differences between fine mull, matted mor, granular mor, and greasy mor, and earthworms are normally absent from these, but the arthropod population is large. Arthropods are most active in the surface of humus layers and present in declining numbers through all horizons containing organic matter.

Index VI to the literature of American economic entomology, January 1, 1935, to December 31, 1939, compiled by M. COLCORD, edited by E. P. FELT and S. W. BROMLEY (College Park, Md.: Amer. Assoc. Econ. Ent., 1942, pp. [10]+815).—A continuation of this index (E. S. R., 80, p. 222).

An apparatus for obtaining interval collections of insects, W. R. HORSFALL and A. V. TULLER. (Ark. Expt. Sta.). (*Ent. News*, 53 (1942), No. 9, pp. 253-258, figs. 5).

On the preparation and preservation of insects, with particular reference to Coleoptera, J. M. VALENTINE. (U. S. D. A.). (*Smithsn. Misc. Collect.*, 103 (1942), No. 6, pp. [1]+16, figs. 5).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 673, 701, 780-794, figs. 2).—Contributions presented (E. S. R., 88, p. 361) are: *Ixodes dentatus* From Iowa, by C. R. Joyce and G. W. Eddy (p. 673) (Iowa State Col.); A Further Note on Wood-Boring by the Drugstore Beetle [Weevil], by E. G. Linsley (p. 701) (Univ. Calif.) (E. S. R., 88, p. 72); Control of Flea Beetles on Potatoes at New Church, Virginia, in 1941, by L. D. Anderson and H. G. Walker (pp. 780-781) (Va. Truck Expt. Sta.); Toxicity of Certain Acid Amides and Their N-Substituted Derivatives to Codling Moth Larvae, by E. H. Siegler and C. V. Bowen (pp. 781-784); Toxicity of Sulfanilamide and Related Compounds to the Codling Moth Larvae, by E. H. Siegler and H. L. Haller (p. 784); Refrigeration Test of Transforming Codling Moth Larvae, by F. W. Carlson (p. 787); Effect of Certain Larvicides on the Overwintering Larvae of the Clear Lake Gnat, by C. C. Deonier and A. W. Lindquist (pp. 788-789); Mixing Poisoned Bait for the Tobacco Budworm, by F. S. Chamberlin and A. H. Madden (pp. 789-790); Two Activators for Pyrethrins in Fly Sprays, by E. R.

McGovran and W. N. Sullivan (p. 792), and The Nature of "Cobalt" Once Recommended for Control of the Tobacco Hornworm, by R. H. Carter (pp. 792-793) (all U. S. D. A.); The Present Status of *Parlatoria chinensis* Marlatt in St. Louis, by J. A. Denning (pp. 784-785); A Continuation of the Studies of the Relative Effects on Insect Metabolism of Temperature Derived From Constant and Varied Sources, by T. J. Headlee (pp. 785-786) (N. J. Stas.) (E. S. R., 85, p. 500); The Introduction and Recovery of *Trissolcus murgantiae* Ashm. in California, by P. De Bach (p. 787), and The Resistance of Citrus Thrips to Tartar Emetic-Sucrose Treatment, by A. M. Boyce, C. O. Persing, and C. S. Barnhart (pp. 790-791) (both Calif. Citrus Sta.); A Killing and Preserving Fluid for Immature Insects, by J. M. Hutzler and A. Peterson (p. 788) (Ohio State Univ.); *Brassica campestris* L. and *Raphanus raphanistrum* L. as Breeding Hosts of the Green Peach Aphid, by W. A. Shands, T. E. Bronson, and G. W. Simpson (pp. 791-792) (U. S. D. A. coop. Maine Sta.); The Median Lethal Dose of Calcium Arsenate for the Honeybee, by O. H. Graham (pp. 793-794) (Tex. A. and M. Col.); and The Vetch Bruchid in Georgia, by J. L. Weimer and T. L. Bissell (p. 794) (U. S. D. A. coop. Ga. Sta.).

[Contributions to a taxonomic symposium] (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 732-761).—Contributions presented at a Taxonomy Symposium held in California in 1941 are: The Needs of Systematic Entomology, by G. F. Ferris (pp. 732-738); The Significance of Taxonomy in the General Field of Economic Entomology, by E. O. Essig (pp. 739-743), and The Present Status of Entomological Nomenclature, by E. G. Linsley (pp. 758-761) (both Univ. Calif.); The Relation of Taxonomy to Biological Control, by C. P. Clausen (pp. 744-748), and Fundamental Taxonomic Problems in Quarantine and Nursery Inspection, by C. F. W. Muesebeck (pp. 753-758) (both U. S. D. A.); and The Significance of Economic Entomology in the Field of Insect Taxonomy, by T. H. Frison (pp. 749-752) (Ill. Nat. Hist. Survey).

Connecticut State entomologist, forty-first report, 1941, R. B. FRIEND ET AL. (Partly coop. U. S. D. A. et al.). (*Connecticut [New Haven] Sta. Bul.* 461 (1942), pp. 457-548+ [3], figs. 9).—A progress report (E. S. R., 86, p. 64) noting studies by M. P. Zappe, L. A. Devaux, J. T. Ashworth, H. A. Merrill, R. C. Botsford, P. Garman, W. T. Brigham, J. C. Schread, G. R. Smith, J. F. Townsend, N. Turner, R. L. Beard, J. P. Johnson, R. B. Friend, H. H. Chamberlin, P. P. Wallace, G. H. Plumb, and A. DeCaprio on control of the gypsy moth, Dutch elm disease, rodent and mosquito control, parasite work, alternate hosts of the parasites of the oriental fruit moth, apple maggot and European red mite control, nonsulfur sprays with special stickers compared with standard materials for control of apple insects, European corn borer, squash vine borer, white grubs, pales weevil injury to white pine plantings in New England, elm bark beetles, and miscellaneous insects, as well as reports on conference of Connecticut entomologists, nursery and apiary inspection, and Japanese beetle quarantine enforcement.

The tenth annual insect population summary of Kansas, 1940, R. C. SMITH and E. G. KELLY. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 44 (1941), pp. 241-256).—A continuation of this annual summary (E. S. R., 84, p. 495).

[Entomological studies in Mississippi], C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, pp. 1, 8).—These pages include Protection of Corn From Weevils (p. 1) and Control of Cattle Grubs or Warbles (p. 8).

[Entomological investigations by the North Carolina Station] (*North Carolina Sta. Rpt.* 1941, pp. 40, 41, 45-46, 49).—A progress report (E. S. R., 86, p. 65) which contains notes on the influence of warm spring evenings on codling

moth activity; the woolly apple aphid; dusting for control of cherry mites; the blueberry mite, a new pest of blueberries; and control of pickleworms by dusting.

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia Proc.* 39 (1942), pp. 35).—Contributions presented (E. S. R., 87, p. 90) include: Biology of the Klamath Midge *Chironomus utahensis* (Diptera: Chironomidae), by D. E. Bonnell and D. C. Mote (pp. 3-7) (Oreg. Expt. Sta.); The Black Witch Moth *Erebus odora* (L.) in British Columbia (pp. 7-9) and Notes on Some Wood-Boring Beetles of Saanich, Vancouver Island, B. C. (Coleoptera: Cerambycidae and Buprestidae) (pp. 9-13), both by G. A. Hardy; The Apple Sawfly *Hoplocampa testudinca* Klug. on Vancouver Island, British Columbia, by W. Downes and H. Andison (pp. 13-16); The Advance of the Codling Moth in British Columbia, by B. Hoy (pp. 16-19); Effect of Lime and Lime-Sulphur on the Larvicidal Value of Cryolite, by J. Marshall (pp. 19-20); A Note on *Laelius* sp., a Parasite of the Carpet Beetle (*Anthrenus scrophulariae* (L.) (Hymenoptera: Bethyridae)) (pp. 21-22) and Insects and Other Arthropods in Buildings in British Columbia (pp. 23-29), both by G. J. Spencer; The Results of Further Work Done on the Control of Grain Mites in British Columbia, by H. F. Olds (pp. 29-32); and Notes on the Laboratory Rearing of Some Canadian Ticks (Acarina), by J. D. Gregson (pp. 32-35).

Insect and other pests of 1941, A. E. CAMERON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 54 (1942), pp. 108-136, figs. 28).—This annual review (E. S. R., 86, p. 353) considers the status of insects and other pests affecting stored products.

Recent quarantine adjustments giving increased consideration to biological findings, T. L. AAMODT and A. G. RUGGLES (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 765-770).

The requirements of parasites for more than hosts, G. N. WOLCOTT. (P. R. Univ. Expt. Sta.). (*Science*, 96 (1942), No. 2492, pp. 317-318).

Synthetic organic compounds as potential insecticides, L. E. SMITH. (U. S. D. A.). (*Indus. and Engin. Chem.*, 34 (1942), No. 4, pp. 499-501).—Attention is called to some of the synthetic organic compounds that have been tested and found to possess sufficient insecticidal value to warrant more extensive trial.

Insecticidal properties of 1,3-Indandiones—effect of acyl groups, L. B. KILGORE, J. H. FORD, and W. C. WOLFE (*Indus. and Engin. Chem.*, 34 (1942), No. 4, pp. 494-497, fig. 1).—The acylated 1,3-indandiones have been found to be very toxic to houseflies when tested according to the Peet-Grady insecticide bio-assay method. The profound effect of the various acylations upon the insecticidal properties of this series of new compounds provides an opportunity to study the relation between organic chemical structure and insect toxicity. The insect toxicity of the acylated indandiones was increased as the number of carbon atoms in the acyl radical was increased from 2 to 5. Thereafter the activity toward flies decreased. The isomeric valeryl-1,3-indandiones exhibited powerful insecticidal action approaching that of the pyrethrins, but their action is not sufficiently rapid for use alone in contact fly sprays. Accordingly, their applications appear to be as a substitute for the major portion of pyrethrum extractives, especially in the more concentrated insecticides. The laboratory preparation of these new compounds is described, as well as the details of the biological evaluation against houseflies.

Free nicotine in arsenical and cryolite dust mixtures, E. H. FLOYD, I. J. BECNEL, and C. O. EDDY. (La. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 620-623).—Experiments with concentrated nicotine dust mixed with various diluents and insecticides are reported. A combination with cryolite and basic

copper sulfate gave perfect control of aphids and the other insects attacking cucumbers and the yield of fruit was significantly greater than that secured from the plats treated according to the established method of control with bordeaux, lead arsenate, and nicotine sulfate spray. The yield of squash was nearly doubled where this form of nicotine was used in a dust treatment which consisted of cryolite, basic copper sulfate, nicotine, and Pyrax, as compared to the same treatment where 95 percent free nicotine was used or where no nicotine was used in the dusts. It was the most effective aphicide used in calcium arsenate mixtures in controlling the cotton aphid in field experiments, and it was as effective as nicotine sulfate in calcium arsenate for reducing the aphid population. In laboratory experiments it was compatible with and effective in killing cotton aphids when tested with 10 different diluents.

The influence of insecticides added to soils on growth and yield of certain plants, D. B. SCOTT, JR., and E. H. KARR (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 702-708, figs. 4).—Report is made of observations on high concentrations of lead arsenate, natural cryolite, and calcium arsenate in sandy loam and clay loam soils and their effect upon the growth and yield of bush lima beans and bell peppers grown in treated soils. "Lead arsenate and calcium arsenate at all concentrations employed in the soil resulted in a considerable reduction of the plant growth, yields, and root development. Natural cryolite in the soil, however, had little effect upon the plants other than slight reductions in the length of the tap root in the 3,000 lb. per foot-acre concentrations in sandy loam. Soluble fluorine in the soil, derived from the addition of natural cryolite, was noticeably reduced after the experiment as revealed by the soil analyses at the beginning and at the end of the experiment. Determinations of the soluble arsenic in the soils support previous reports by other investigators that arsenic remains in the soluble toxic form in certain types of soil for a number of years."

Insecticides to control bollworm, boll weevil, cotton aphid, and cotton flea hopper, K. P. EWING and R. W. MORELAND. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 626-629).—In the experiments reported, basic copper arsenate mixed with sulfur or lime produced higher yields of cotton than calcium arsenate, lead arsenate, or cryolite for the control of the bollworm and the boll weevil and higher yields than sulfur or sulfur-arsenical mixtures for the control of the cotton flea hopper. The increase in aphids following dusting with basic copper arsenate and sulfur was less than half as great as that following dusting with calcium arsenate or zinc-safened calcium arsenate. On cotton dusted with calcium arsenate there were 3.6 times as many aphids when 0.5 percent of rotenone was added as when 1 percent of nicotine was added. Calcium arsenate containing zinc sulfate did not show much promise in holding down aphids.

The control of pillbugs and sowbugs, R. M. BOHART and A. MALLIS. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 654-658).—Laboratory experiments were conducted with 26 different materials with a view to determining their relative toxicity to *Armadillidium vulgare* (Latr.) and sowbugs (*Porcellio* spp.). At a concentration of 5 lb. to 1,000 sq. ft. the materials found ineffective were basic lead arsenate, tartar emetic, sodium fluoride, natural cryolite, dicyclohexylamine dinitro-*o*-cyclohexylphenate, nicotine bentonite (5 percent nicotine), nicotine sulfate dust (10 percent nicotine sulfate), derris dust (two mixtures), phenothiazine, sulfur dust, and hydrated lime. Partially effective (64 to 83 percent mortality after 3 weeks) were acid lead arsenate, copper carbonate, sodium fluosilicate, and pyrethrum dust (0.2 percent pyrethrins). Highly lethal at 5 lb. to 1,000 sq. ft. and arranged in descending order of toxicity based on lower dosages were mercuric chloride, sodium arsenite, paris green, mercurous chloride, sodium arsenate, manganese arsenate, calcium arsenate, copper cyanide, and white arsenic. Of

these, calcium arsenate appears to be the most practical from the standpoint of cost, availability, and plant injury.

In a separate laboratory experiment with three insecticides it was observed that paris green and copper cyanide were capable of causing considerable mortality purely by contact with the under surface of the body. Calcium arsenate was the least toxic of the three as a contact poison.

Field tests using calcium arsenate (3 to 5 lb. to 1,000 sq. ft.) gave satisfactory results.

Insecticide tests for cotton aphid and boll weevil control during 1941, I. J. BECNET and E. H. FLOYD. (La. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 623-626).—Experiments conducted in two localities with calcium arsenate alone and with other materials to determine their effect upon the cotton aphid, the boll weevil, and upon the yield of seed cotton are reported, the results being analyzed statistically. The cotton aphid and boll weevil infestations were lowest on plats receiving calcium arsenate plus 1 percent nicotine, the average yield increase over the checks being 359 lb. of seed cotton per acre; with calcium arsenate plus 10 percent sulfur and 0.5 percent rotenone 168 lb.; with calcium arsenate plus 10 percent sulfur and 0.2 percent pyrethrins 258 lb., and with calcium arsenate alone 323 lb.

Control of insects in fourteen thousand corn bins, M. D. FARRAR and W. P. FLINT. (Ill. Nat. Hist. Survey, Ill. Expt. Sta., and U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 615-619).—Of 12 fumigating mixtures tested at several dosage levels to determine their respective toxicity to grain insects, those offering the most promise as highly toxic fumigants for shelled corn in steel bins are ethylene dichloride-carbon tetrachloride (3-1)-methyl bromide 10 percent, propylene dichloride-carbon tetrachloride (3-1)-methyl bromide 10 percent, and Ethide-carbon tetrachloride and chloropierin-carbon tetrachloride. Satisfactory if sufficient dosage is used are ethylene dichloride-carbon tetrachloride (3-1), carbon bisulfide, carbon tetrachloride-carbon bisulfide (4-1), and similar proprietary mixtures. Methyl bromide when used alone was not a satisfactory grain fumigant in steel bins.

Stem galls of sugar-cane induced with insect extracts, J. P. MARTIN, (Hawaii. Sugar Planters' Expt. Sta.). (*Science*, 96 (1942), No. 2480, p. 39).—Reference is made to the production in 1936 of stem galls of sugarcane, for the first time, by artificial inoculations of extracts of the green leafhopper *Draeculacephala mollipes*, and evidence is presented indicating that the stimulus to gall formation is chemical in nature. In studies in 1941 galls were produced with an extract prepared from adults of the corn leafhopper *Peregrinus maidis* and the pink sugarcane mealybug *Trionymus sacchari*. It was shown that stem galls developed when extracts prepared from the corn and green leafhoppers were sterilized at 15 lb. steam pressure for 20 min., thus indicating that the stimulus to gall formation is chemical rather than biological in nature.

The use of frass in the identification of forest insect damage, R. F. MORRIS (*Canad. Ent.*, 74 (1942), No. 9, pp. 164-167, fig. 1).—This contribution includes a frass key for the identification of certain spruce defoliators.

Lice and some other external parasites of domestic animals and poultry in the Province of Quebec, W. E. WHITEHEAD (*Macdonald Col., McGill Univ., Farm Bul.* 7 (1942), pp. 27, pls. 6, figs. 2).

The nymphal development for the [American cock]roach (*Periplaneta americana* L.), J. T. GRIFFITHS and O. E. TAUBER. (Iowa Expt. Sta.). (*Jour. N. Y. Ent. Soc.*, 50 (1942), No. 3, pp. 263-272, fig. 1).—At a temperature of 29° C. (84.2° F.) the female American cockroach generally required 11 and the male 12 instars before reaching maturity. More stadia are necessary for some indi-

viduals. It is suggested that this increase may be due to unfavorable environmental conditions or bodily injury. The males averaged 276 (range 198-346) and the females 251 days (range 171-360) to complete their development at 29°. Similarly, at room temperature the females became adults sooner than did the males. Under laboratory conditions and at room temperature a complete reproductive cycle ("egg to egg") may be passed in about 243 days, but normally it takes about 15 mo. The entire life span (egg to "natural" death) usually extends over a period of about 630 days, but may last for more than 1,200 days. The regeneration of certain parts, such as portions of lost appendages, is possible throughout nymphal development.

The compound 4,6-dinitro-o-cresol as a cockroach poison, J. B. GAHAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 669-673).—In toxicity tests against the American cockroach 4,6-dinitro-o-cresol was found to be more toxic and to kill more rapidly than either sodium fluoride or pyrethrum within a 3-day period, being more effective at a 5-percent concentration than pyrethrum at 5 percent or sodium fluoride at 50 percent. Exposure to the air in a room for 7 days did not destroy the toxicity of a 10-percent dust. In tests designed to eliminate the possibility of ingestion the compound was highly effective as a contact insecticide. Of seven materials tested as diluents, talc and redwood bark flour were found to be the most effective.

Tartar emetic for thrips control on greenhouse carnations, R. D. EICHMANN (*Washington Sta. Bul.* 417 (1942), pp. 35, figs. 10).—The onion thrips and the gladiolus thrips injure carnations in Washington greenhouses by rupturing the petal surface and ingesting the pigmented plant juices and by so doing produce decolorized areas. Since thrips spend most of the time inside the flowers bait type sprays are superior to contact insecticides. From 1 to 1.5 lb. of tartar emetic plus 3 lb. of white sugar per 100 gal. of spray gave excellent results. The varieties less susceptible to evidence of thrips damage have proved valuable to carnation producers.

Control of the tobacco thrips on shade-grown tobacco in Connecticut, A. W. MORRILL, JR. (U. S. D. A. coop. Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 646-649, fig. 1).—The results of experiments conducted with shade-grown tobacco at Windsor, Conn., from 1936 to 1941, inclusive, for the control of the tobacco thrips are reported, the details for 1938-41 being given in table form.

Control of plant bugs in citrus groves, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 23 (1942), No. 11, pp. 4-5)

A study of leafhopper feeding injury to food manufacture and water-vapor loss of grape leaves, H. W. BRODY, N. F. CHILDERS, and G. E. MARSHALL. (Ohio State Univ. and Purdue Univ.). (*Amer. Fruit Grower*, 61 (1941), No. 8, pp. 6, 14, figs. 4).

The place of concentrated sprays in the pea aphid control program, H. GLASGOW. (N. Y. State Expt. Sta. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 649-653, figs. 3).—Report is made of work conducted during the past 5 yr. with a view to determining the practicability of using highly concentrated sprays for pea aphid control.

The summer host of *Aphis fabae* Scop., M. G. JONES (*Bul. Ent. Res.*, 33 (1942), No. 3, pp. 161-169).—Experiments have shown that when spring migrants of *A. fabae* from *Euonymus europaeus* and *Viburnum opulus* are given a choice of summer host plants enclosed by a muslin cage they col nize bean first and then sugar beet. Dock, poppy, and *Chenopodium* are colonized in no very definite order, but thistle is the last plant to be infested. Further infestation of surrounding plants takes place rapidly by means of apterae, which migrate actively

and colonize plants at random. The total number of aphids on the summer host plants is of the same order as the times of colonization. The effect of parasites and predators is proportional to the numbers present and to the size of the colony.

Propagation of black scale on potato sprouts, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 687-689, figs. 2).—An account of the use of green potato sprouts for the mass propagation of black scale, which use is now as well established as is the use of bleached sprouts for the production of mealybugs.

Control of hemipterous cotton insects by the use of dusts, J. R. EYER and J. T. MEDLER. (N. Mex. Expt. Sta. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 630-634, fig. 1).—Of the pentatomid and mirid plant bugs that injure cotton in the irrigated valleys of southern New Mexico, *Adelphocoris superbus* (Uhl.) and species of the genera *Lygus* and *Chlorochroa* are the most important. In a block experiment conducted at State College in 1941 a substantial increase in the yield of cotton was found to result from the use of dusts of paris green and sulfur and calcium arsenate and sulfur. These arsenical-sulfur combinations also produced relatively high mortalities in the case of three species, i. e., Say stinkbug, *L. hesperus*, and *A. superbus*, confined in large field cages.

Cooperative distribution of organisms causing milky disease of Japanese beetle grubs, R. T. WHITE and S. R. DUTKY. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 679-682).—Report is made of the progress of colonization work conducted by the U. S. Department of Agriculture in cooperation with 11 States and the District of Columbia in the distribution of milky disease organisms with a view to accelerating their natural spread.

Laboratory tests of organic fumigants for wireworms, R. S. LEHMAN. (U. S. D. A. coop. Wash. and Idaho Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 659-661).—In a series of experiments conducted for the purpose of determining the effectiveness of various liquid organic compounds, 114 in number, as fumigants against wireworms, particularly the Pacific coast wireworm and the sugar beet wireworm in the soil, the median lethal concentration of 57 was determined. In this series allyl isothiocyanate proved to be the most toxic compound tested. When it was used in air alone in earlier experiments by the author (*E. S. R.*, 70, p. 511) practically the same results were obtained. Of all the fumigants tested in these experiments 10 showed median lethal concentrations lower than carbon disulfide and 46 higher. "Of the 9 compounds that were more toxic than carbon disulfide in air alone, only 3 were more toxic in the soil, and the relative toxicity was much less. The soil evidently absorbs much of the fumigant, making it less available to the insect. It is also true, as other (unpublished) tests have shown, that in the field diffusion plays an important part. Thus chloropicrin, which is 14.3 times as toxic as carbon disulfide in soil in the laboratory, is only twice as toxic in the field. Allyl isothiocyanate, which is 29.3 times as toxic in the laboratory, has about the same toxicity as carbon disulfide in the field. The greater toxicity of carbon disulfide to wireworms in the field is probably due to its ability to diffuse and its small loss by absorption in the soil."

The relative toxicities of some of the compounds tested as compared with carbon disulfide, when used both in soil and in air alone, are presented in a table.

Control of flea beetles on cigar-wrapper tobacco with cube dust in the Florida-Georgia area, F. S. CHAMBERLIN and A. H. MADDEN. (U. S. D. A. coop. Fla. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 634-637).—Report is made of experiments conducted at Quincy, Fla., 1938-40, to determine the proper schedule and number of applications of a cube root and tobacco dust mixture containing 1 percent of rotenone for the control of the tobacco flea beetle on

cigar-wrapper tobacco. The results indicate that the most profitable schedule may be expected to vary from season to season. One application per week, with a total of 11 applications for the season, gave the most economical control under conditions of heavy infestation, while 1 application every 10 days, with a total of 3 applications per season, was sufficient with a very light infestation. The authors are led to conclude that 1 application per week from transplanting time until the crop approaches maturity will normally give adequate protection.

Toxicity of acrylonitrile, chloroacetonitrile, ethylene dichloride, and other fumigants to the confused flour beetle, H. H. RICHARDSON and A. H. CASANGES. (U. S. D. A.). (Jour. Econ. Ent., 35 (1942), No. 5, pp. 664-668, figs. 2).—Laboratory tests of the toxicity of certain chemicals as fumigants against the confused flour beetle in 5-hr. exposures at 25° C. are reported. Small volumes of chemicals as volatile as carbon disulfide were conveniently measured by use of a small hypodermic syringe attached to a micropipette. Acrylonitrile and chloroacetonitrile were the most toxic chemicals and appear worth further study as fumigants. They were also very toxic to the bedbug. "Other chemicals tested are listed by groups approximately in the order of decreasing toxicity, as follows: (1) Methyl bromide, 1,1-dichloro-1-nitropropane, and 1,1-dichloro-1-nitroethane, (2) methyl allyl chloride, methyl allyl bromide, and ethylene oxide, (3) carbon disulfide, and (4) ethyl bromide. Ethylene dichloride was found to have a delayed killing action which increased mortality considerably over a period of about 20 days after fumigation. A noninflammable mixture with carbon tetrachloride (3:1 by volume) also showed a latent effect, but the carbon tetrachloride added little or nothing to toxicity. Judging only from the mortality produced after 20 days, ethylene dichloride is not far below methyl bromide in the toxicity scale. However, beetles fumigated with these low concentrations of ethylene dichloride may lay viable eggs before death, and the dosages must be increased to prevent egg laying."

Three curculionid pests of the oiticica nut, L. PYENSON (Jour. Econ. Ent., 35 (1942), No. 5, pp. 715-718, figs. 2).—Report is made of observations on three curculionid pests of the oiticica tree (*Licania rigida*), namely, *Conotrachelus licaniae* Marsh. and two undetermined or possibly new species of the genus in the river valleys of Brazil. It is pointed out that recently the nuts of this tree have become of commercial importance as a source of a fairly light colored oil which greatly resembles tung oil in odor and in many of its other physical and chemical properties.

Life history, habits, and control of the beanstalk weevil *Sternechus paludatus* in the Estancia Valley, New Mexico, J. G. SHAW and J. R. DOUGLASS (U. S. Dept. Agr., Tech. Bul. 816 (1942), pp. 36, figs. 19).—*S. paludatus* (Casey), a new pest of bean plants, is found in the foothills of the Manzano Mountains which border the Estancia Valley on the west. In the spring most of the weevils leave their natural host, New Mexican locust (*Robinia neomexicana*), to feed on young bean plants in nearby fields. Damage or destruction of both hosts occurs from oviposition scars, larvae feeding within the stems and leaf petioles, and external feeding on tender areas by the adult. Life history studies revealed that the weevil has only one generation, and only the overwintered females oviposit. Eggs are deposited from May through August. Young bean plants were used for developmental studies, and sections of stems containing eggs and subsequently larvae were held in test tubes for observation. Full-grown larvae enter the soil to pupate, and to observe subterranean development a special rack to hold soil was constructed. The ends and bottom, made of wood, supported parallel pieces of glass, and adjoining these plates cells were molded to accommodate each larva. The developmental period from egg to adult required from about 50 to

70 days, and the rate of development compared with the average mean temperature suggests a linear relationship. Adults hibernate successfully in litter in the ponderosa pine and nut pine forest zones. Temperature seems to be the sole factor in influencing emergence from hibernation. Activity begins at about 45° F. The only known insect enemies of this weevil affect the egg stage, namely, a thrips and nymphs of the insidious flower bug *Orius insidiosus* (Say). Best control with insecticides under laboratory conditions was obtained with barium fluosilicate and zinc arsenite, the former having an immediate effect and the latter a much more delayed one.

Certain plume moths of economic importance in California, W. H. LANGE, JR. (Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 718-724, figs. 6).—Report is made of the study of five species of Pterophoridae of the genus *Platyptilia*, which cause damage of economic importance in California either to agriculturally grown plants or, in one case, to plants of importance as sources of nectar for honeybees, namely, *P. carduidactyla* (Riley), *P. antirrhina* Lange, *P. williamsii* Grinnell, *P. fuscicornis* Zeller, and certain races of *P. pica* Wlsm.

A survey of biological destruction of cactus on Nebraska range land, M. W. PEDERSEN. (Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 8, pp. 769-770).—A survey of the destruction of cacti (*Opuntia hemifusa* and *O. fragilis*) on the range in the hard lands and sand hills near Valentine, Nebr., by the caterpillar of a pyralid moth of the genus *Melipotis*, thought to be *M. dentata*, is reported. The author's observations indicate that in the areas covered the spread of these cacti is being effectively controlled by this caterpillar. While the ecology of this insect has not been worked out for this area, observations indicate that its activity should be taken into consideration in range management of short-grass vegetation.

Supplementary control measures for codling moth, A. M. WOODSIDE (*Virginia Sta. Bul.* 342 (1942), pp. 19, figs. 6).—Increasing difficulty in the control of codling moth by sprays has stimulated demand for information on the effectiveness of packing shed and general orchard sanitation, scraping of the trees, treating cavities and decayed places, proper pruning practices, chemically treated bands, and bait traps. This publication notes that a tightly constructed packing shed traps many moths escaping from orchard crates and storage. Cocoons in boxes can be killed by submergence in boiling water for 1 min. Prop poles should be stacked outside the orchard. Thinning in heavily infested orchards kills many larvae if this fruit is destroyed properly. Hibernating worms may be killed by scraping off the rough bark and burning it during the winter. Experimental results show that proper banding will reduce infestation 35 to 50 percent. Reductions of about 50 percent in fruit infestation have been obtained where a bait trap was used in each tree in time to catch the earliest of the spring-brood flight.

[Codling moth control] (*Vermont Sta. Bul.* 495 (1942), pp. 30, 31, fig. 1).—The results of further studies on moth flight by M. B. Cummings and C. H. Blasberg (*E. S. R.*, 86, p. 358) are reported.

A study of codling moth oviposition in a mixed pear orchard, C. C. HATTINGH (*Jour. Ent. Soc. South. Africa*, 5 (1942), pp. 137-146).

Biological control of the codling moth in South Africa, R. I. NEL (*Jour. Ent. Soc. South. Africa*, 5 (1942), pp. 118-137).

Methyl bromide fumigation to control oriental fruit moth on dormant nursery stock, A. C. JOHNSON, E. M. LIVINGSTONE, and J. W. BUIJER (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 674-677, figs. 2).—In the search for a quick and economical method for the treatment of nursery stock hosts of the oriental fruit moth tests were made of trichloroethylene, ethyl formate,

methyl bromide, a mixture of ethylene oxide and ethylene dichloride, and ethylene dichloride alone, and methyl bromide was selected as the most promising. All stages of the insect were tested, the eggs and larvae being the most resistant. Dosages of 1.5 lb. of methyl bromide per 1,000 cu. ft. for a period of 4 hr. at 60° F. or 1 lb. at 70° were found to be lethal to overwintering larvae (the stage occurring on dormant nursery stock) in atmospheric fumigations. Recommended dosages for commercial use were 3 lb. per 1,000 cu. ft. for 4 hr. at 60° or 2 lb. for 4 hr. at 70°.

Investigations on the control of the European corn borer (*Connecticut [New Haven] Sta. Bul. 462 (1942), pp. 549-591, figs. 16*).—This contribution is presented in two parts, as follows:

I. Biological aspects, R. L. Beard (pp. 551-566).—Research conducted in 1940 and 1941 indicated that during the egg-laying period of the European corn borer moth eggs are deposited on plants smaller than the midwhorl stage. When eggs are deposited on plants smaller than the late whorl stage few of the emerging larvae become established. Beyond this stage of plant growth a gradient of survival increasing in the older plant stages appears. Due to escape from oviposition and inability to support larvae, plants smaller than the late whorl stage at the time of moth flight are not likely to be severely infested. The principal primary infestation is in the tassel in plants larger than the midwhorl stage and smaller than the early silking stage. The tassel in plants larger than the early silking stage does not support larvae, and the borers which were resident there secondarily infest other parts of the plant. Stalks absorb the principal part of the secondary infestation. Developing ears are the preferred location in plants of the early silking stage or larger. The borer attack in the ears, therefore, is due more to a primary infestation than to the migrants from the previously infested tassel.

II. Studies of insecticides, N. Turner (pp. 567-591).—Continuing earlier work (W. S. R., 77, p. 665), no definite advantage was found, in tests covering the period 1936-41, for the addition of spreading agents to ground derris or cube root for corn borer sprays. Dusts containing 1 percent rotenone in pure ground derris root were not as effective for European corn borer control as dual-fixed nicotine containing 4 percent nicotine. Inert materials impregnated with extracts of pure ground derris or pyrethrum flowers were not significantly less effective than rotenone dust. At lower percentage nicotine, nicotine bentonite was more toxic than dual-fixed nicotine, but the reverse was true when the nicotine content was increased. With nicotine bentonite approximately 11 percent nicotine would be required to be as effective as 4 percent nicotine in dual-fixed nicotine. Dust applications with hand dusters were more effective than by means of a power duster. Modifications of the standard schedule of four treatments at 5-day intervals for control of the first generation were less effective than the standard. Data indicate that in the tests made, where treatment was confined to the hatching period, number of treatments was more important in general than any of the timing tried. For control of second generation larvae four treatments applied at 7-day intervals was almost as effective as five treatment at 5-day intervals.

Factors determining the reduction in yield of field corn by the European corn borer, L. H. PATCH, G. W. STILL, M. SCHLOSBERG, and G. T. BORTGER.

(U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 10, pp. 473-482, fig. 1).—Field corn plats were infested by hand with egg masses of the European corn borer to obtain different levels of population of borers. The reduction of yield within cornfields was linear up to 22 borers per plant. Data from 18 plantings of the Clarage variety in various localities in northwestern Ohio from 1929

through 1933 showed that the rates of yield reduction were 2.68 and 4.86 percent per borer per plant when normal yields were 85 and 28 bu. per acre, respectively. Yield from plantings of hybrids was reduced 3.02 percent per borer per plant when the normal yield was 85 bu. and 3.93 percent at a yield level of 105 bu. During drought the damage per borer at a given yield level appears to be increased. Soil types or fertility levels appeared to have no direct effect on the rate of yield reduction per borer. For a 4-yr. period the average normal yield of 85 bu. per acre for corn planted on the average date of May 9 was reduced 2.85 percent per borer compared with 4.71 percent for the same hybrids giving about the same average yield but planted 23 days later. Plants of the later plantings although infested at the same time as early plantings were in a relatively early stage of development and were more severely damaged because of the longer period of borer feeding before the critical period of ear production and the consequent weaker condition of the plants and the larger average size of borers during the period of ear production. Attempts to find hybrids able to maintain their yields in the presence of a given level of borer population to a greater degree than would other hybrids of equal yielding ability were without much success.

Development of synthetic food media for use in nutrition studies of the European corn borer, G. T. BOTTGER. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 10, pp. 493-500).—Information from various nutritional studies on the European corn borer was used in conducting a series of tests for rearing larvae on a synthetic food medium. Twenty food mediums formulated to approximate the composition of green corn tissue were placed in rearing receptacles and infested with newly hatched larvae. As many as 36 percent of the larvae confined to synthetic food survived to maturity. In one trial 30 percent and in four others 20 percent or more of the larvae pupated. Casein appeared superior to zein as a source of protein, while a 2:1 ratio of glucose to sucrose appeared to satisfy the carbohydrate requirement of growing larvae. The tests indicated that vitamins A, B₁, and E are of nutritional value to European corn borer larvae, particularly in the absence of a sufficiently high concentration of casein in the food medium.

Development and use of sugarcane varieties resistant to the sugarcane borer, R. MATHES and J. W. INGRAM. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 638-642).—Work under way from 1936 to 1941, inclusive, on the resistance of common varieties of sugarcane to the sugarcane borer, the comparative susceptibility to sugarcane borer injury of several promising new varieties of sugarcane potentially suitable for release to growers, and new varieties resistant to the borer is considered, accompanied by tabulated data.

Tomato fruitworm control, J. L. HOERNER. (Colo. Expt. Sta.). (*Canning Age*, 23 (1942), No. 10, p. 533).

Results attained in the biological control of *Diatraea saccharalis* (F.) in Florida, L. C. SCARAMUZZA and J. W. INGRAM. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 642-645).—The work of introduction and colonization of sugarcane borer parasites is reported upon.

Catálogo sistematico y zoogeografico de los lepidopteros Mexicanos.—I, Papilionoidea. II, Hesperioidea. III, Sphingoidea y Saturnioidea [Systematic and zoogeographic catalog of the Lepidoptera of Mexico, I-III], C. C. HOFFMAN (*An. Inst. Biol.* [Univ. Nac. Mex.], 11 (1940), No. 2, pp. 639-739, figs. 2; 12 (1941), No. 1, pp. 237-294; 13 (1942), No. 1, pp. 213-256).—The several parts of this catalog deal with the Papilionoidea, Hesperioidea, and Sphingoidea and Saturnioidea, respectively. An index to the genera and species accompanies each of the parts.

Notes on mosquitoes in Nebraska (Diptera: Culicidae), H. D. TATE and W. W. WIRTH. (Nebr. Expt. Sta.). (*Ent. News*, 53 (1942), No. 8, pp. 211-215).—A list is given of 19 species of mosquitoes collected in Nebraska, accompanied by localities in the State in which they have been collected.

Simple tests for estimating the suitability of mineral oils as mosquito larvicides, W. A. L. DAVID (*Bul. Ent. Res.*, 33 (1942), No. 3, pp. 195-203).

Biology of the narcissus bulb fly in the Pacific Northwest, C. F. DOUCETTE, R. LATTA, C. H. MARTIN, R. SCHOPP, and P. M. EIDE (*U. S. Dept. Agr., Tech. Bul.* 809 (1942), pp. 67, figs. 28).—The narcissus bulb fly is a major pest of narcissus in the Pacific Northwest. Eggs are deposited at the base of the foliage or in the soil nearby and hatch in from 10 to 12 days. Larvae enter the bulbs in late May and June and develop through three instars to mature size by late September or October and overwinter in the bulbs. These leave the bulbs in early spring and pupate close to the soil surface, and adults emerge in May and June. Development of some larvae is retarded so they pass the first winter as second or third instars, reach maturity the second summer, and pupate the next spring. Larvae cause damage usually by entering through the basal plate and burrowing upward into the scale region, eventually consuming a large part of the bulb. Average infestation of narcissus in the Pacific Northwest has ranged between 2.5 and 4.5 percent, and the value of infested bulbs is estimated at from \$80,000 to \$100,000 each year. Natural larval mortality in commercial stocks has averaged between 25 and 51 percent of the larvae successfully entering the bulbs. In the Pacific Northwest natural enemies have not become important.

Toxicity of paradichlorobenzene to third-instar larvae of the housefly, H. C. MANIS, A. L. DUGAS, and I. FOX. (Iowa State Col.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 662-664, fig. 1).—In tests of the toxicity of paradichlorobenzene to the third-instar larvae of the housefly it was found that concentrations above 249.4 mg. per 100 gm. of treated food are quite toxic to the larvae, and at a concentration of 1,234.6 mg. per 100 gm. of treated food 100-percent mortality was obtained. The median lethal concentration of paradichlorobenzene was found to be 430.5 mg. per 100 gm. of treated food. Concentrations corresponding to 497.5 and 1,234.6 mg. per 100 gm. of treated food resulted in 100-percent mortality in open and closed garbage pails when applied as a layer over the top of the food. The toxic action of paradichlorobenzene in these experiments is apparently due to its combined actions as a fumigant and a stomach poison.

Waste celery as a breeding medium for the stablefly or "dog fly," with suggestions for control, S. W. SIMMONS and W. E. DOVE. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 709-715, figs. 2).—It has been found that in Florida waste celery is an important breeding place for the stablefly, more commonly known in that State as the dog fly. "At Sanford, Belle Glade, Sarasota, Wiersdale, and Island Grove the present methods of disposing of about 180,000 to 270,000 cu. yd. of waste celery have resulted in severe localized outbreaks. The maximum density of dog fly breeding was calculated at 54,462 flies per cubic foot, and in selected places the housefly breeding was even more dense. Soon after exposure green strippings became infested, and in a little less than 18 days they produced adult dog flies. Where infested strippings were plowed under, third-stage larvae and pupae continued to produce flies. One cage containing 36 sq. ft. of plowed-under strippings produced a total of 11,653 dog flies in 5 days. For the treatment of infested litter some effective insecticides were found, but on account of the expense and time involved in treating the huge quantities it is suggested that the waste be crushed at the washing plants and

that the pulp be conveyed automatically through a vat of diluted creosote or gas condensate. It appears that the saving from treating the smaller quantity of waste would more than offset the cost of the crushing machinery and insecticide."

The cabbage maggot in North Carolina, B. B. FULTON (*North Carolina Sta. Bul.* 335 (1942), pp. 24, figs. 7).—The cabbage maggot, a pest in the mountains of North Carolina, has three generations each year, but only the first is destructive to cabbage. Winter is spent in puparia in the soil. Flies emerging gradually increase until the mountain laurel starts to bloom and then decrease rapidly. Three applications of mercury insecticides gave good control of maggots in seedbeds. Late planting reduces or eliminates the need for insecticidal protection, for example maggot injury is greatly reduced if plant bed seeding is delayed until flowering dogwood is in full bloom. Proper location of seedbeds, washing roots of plants before setting, and elimination of fall hosts such as cabbage stumps and turnips aid in the reduction of infestations. Radishes as a trap crop proved of little value. Cabbage flea beetle injury is sometimes severe in seedbeds and is confused with cabbage maggot injury.

Plague flea, *Xenopsylla cheopis*, in Kansas, A. W. GRUNDMANN, H. P. BOLES, and J. E. ACKERT. (Kans. Expt. Sta.). (*Kans. Acad. Sci. Trans.*, 44 (1941), pp. 238-240).—A more detailed account of the oriental rat flea than that noted (E. S. R., 85, p. 511).

Pollen grains in nectar and honey, F. E. TODD and G. H. VANSSELL. (U. S. D. A. coop. Univ. Calif.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 728-731).—The data presented in tables include the pollen grains in hand-collected nectar, the frequency distribution of the number of pollen grains in the honey stomach of bees 15 min. after feeding as compared with the number immediately after feeding, the number of pollen grains in three types of food before feeding and after storage by the bees, a comparison of pollen counts in nectars from nine plants when collected by hand and by the bees, and the pollen content of bee-collected nectars arranged in order of increasing number of grains.

Damage to highways by the mound-building prairie ant, R. F. FRITZ and W. A. VICKERS. (Kans. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 725-727, fig. 1).—An account of the mound-building prairie ant *Pogonomyrmex occidentalis* Cress., which is abundant throughout central and western Kansas, especially along roads and highways, where conditions are favorable to its existence. Every year these ants do considerable damage to highway shoulders and surfaces because of their custom of clearing the shoulders of soil-binding vegetation and of building nests beneath the road surface. Control of this ant can be accomplished by evaporating carbon disulfide under a galvanized tub inverted over the mound.

Some preliminary observations on the effect of sweetened ant poisons on bees, F. SHAW. (Mass. State Col.). (*Gleanings Bee Cult.*, 70 (1942), No. 9, pp. 538-539).

On a new species of *Ephialtes* (Hym.: Ichneumonidae) parasitizing the codling moth, J. F. PERKINS (*Bul. Ent. Res.*, 33 (1942), No. 3, pp. 171-174).—An ichneumonid parasite of the codling moth reared in the south of France is described as new under the name *E. cydiae*.

Effect of dormant sprays on parasites of the San Jose and terrapin scales, J. A. COX. (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 698-701, fig. 1).—In the laboratory insecticides commonly used in dormant sprays for orchard pests were quite toxic to parasites of the San Jose and terrapin scales. The parasites reared from the San Jose scale were *Prospaltella perniciosus* Tower, *P. diaspidicola* Silv., *Phycus varicornis* How., *Marietta carnesi* How., *Anagrus epos* Gfr., and *Aphytis mytilaspidis* Le Baron, and from the terrapin scale

Coccophagus fuscipes How., *C. lycimnia* Walk., *P. varicornis* How., *Chiloneurinus microphagus* Mayr; *Thysanus pulchra* Gir., *M. mexicana* How., *Tetrastichus belpyri* Ashm., *Aphycus stomachosus* Gir., *Aphycus* sp., and *Asteropaeus* sp. It is apparent from the information gained that the present spray practices have a tendency to reduce the parasites in sprayed orchards.

Metaphycus helvolus, an encyrtid parasite of the black scale, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 690-698, figs. 2).—Observations of *M. helvolus* (Comp.), an encyrtid parasite of lecanine scales introduced into California from Africa in 1937, are reported. The importance of this parasite in the control of the black scale in South Africa was obscured by the influence of the Argentine ant on the relative abundance of the parasites of this scale, but since the establishment of *M. helvolus* in California in 1937 it has become a dominant factor there in the reduction of the black scale over wide areas. Its effectiveness is, in part, an effect of the predatory habits of the female adult, its exceptionally long oviposition period, its short life cycle, and its solitary parasitization of the stages of the host having the longest period of exposure. *M. helvolus*, *Coccophagus trifasciatus* Comp., and *M. lounsburyi* (How.) are compared as to certain biological characteristics. Insecticides tend to decrease the effectiveness of *M. helvolus* directly by destroying the female adults at a time when there is a scarcity of hosts harboring the immature parasites, or indirectly by bringing about an even-hatch condition of the host generations so that there is a lack of food for the parasites.

A note on technique for routine examinations of parasitic hymenopterous larvae, G. C. ULYETT and J. S. v. D. MERWE (*Jour. Ent. Soc. South. Africa*, 5 (1942), pp. 147-151).

The distribution of the European spruce sawfly *Diprion polytomum* (Htg.) in the Scandinavian and eastern Baltic countries, W. F. SELLERS. (U. S. D. A.). (*Bul. Ent. Res.*, 33 (1942), No. 3, pp. 149-159, pl. 1, fig. 1).—A survey of the Scandinavian and eastern Baltic countries has shown the most favorable habitats of the spruce sawfly in Europe, as noted by Reeks and Balch et al. (*E. S. R.*, 86, p. 813) to be in one-generation areas under conditions which provided a maximum of sun heat, moisture, and shelter near to the upper limits of spruce growth. The least favorable habitats are the drier, less humid places, especially in the two-generation areas. Sawflies were found everywhere on spruce from the German-Danish border in Denmark and in southern Norway to the northernmost spruce forests of Sweden and from far above the Arctic Circle in Finland southward through the eastern Baltic countries of Estonia, Latvia, and Lithuania. The range of distribution covered in this survey was from approximately latitude 55° in Denmark and Lithuania to latitude 68°45' in Finland. This includes most of the Scandinavian Peninsula, Fennoskandia, and the eastern Baltic countries. Spruce comprised from 25 to 40 percent of the productive forest land of this large area.

An analysis of the biological control of the European spruce sawfly in New Hampshire, with particular reference to predators, J. G. CONKLIN (*Ohio State Univ., Abs. Doctoral Diss.*, No. 37 (1942), pp. 63-73).—The marked reduction in the sawfly population during the years of the investigation here reported could not be attributed to the activities of predators, it being caused chiefly by an unidentified disease that affected the larval stages.

Diapause and egg intoxication in *Diprion polytomum* Hartig, A. R. GOBELL (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 677-679).

A new Olesicampe parasite of *Pikonema* sawflies (Hymenoptera: Ichneumonidae), G. S. WALLEY (*Canad. Ent.*, 74 (1942), No. 10, pp. 193-194).—An ichneumonid parasite reared from two sawflies of the genus *Pikonema* (P.

alaskensis (Rohw.) and *P. dimmockii* (Cress.) is described as new under the name *O. pikoncmac*.

The insect-food and hymenopterous parasites of the South African poisonous "button spider" *Latrodectus indistinctus* Camb., A. J. Hesse (*Jour. Ent. Soc. South. Africa*, 5 (1942), pp. 45-63, figs. 3).

Influence of leaf age and feeding injury on the citrus red mite, C. F. HENDERSON and J. K. HOLLOWAY. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 5, pp. 683-686).—Leaf injury caused by the feeding of the citrus red mite, rendering the leaves unsuitable as food, is shown to be a factor capable of causing the rapid reduction in mite populations that often occur when climatic conditions are apparently favorable and natural enemies are extremely scarce. Two reactions of the mite to leaf injury have been observed, namely, a high reduction in egg production accompanied by a slight increase in mortality. This would indicate some form of nutritional influence which had a more pronounced effect on egg production than on mortality. This reduction in egg production associated with leaf injury was not due to any toxic condition transmissible from one portion of the leaf to another. The numbers of eggs produced on young and medium-age leaves were significantly greater than on old leaves. Feeding injury influenced egg production to a much greater extent on flush-growth leaves than on older leaves.

The season's experiments with red mite control, C. R. CUTRIGHT. (Ohio Expt. Sta.). (*Ohio State Hort. Soc. Proc.*, 75 (1942), pp. 32-44).—A late-spring dormant application of petroleum oil is recommended as a spray for red mite control, experiments having shown somewhat better results to be obtained when a 4 percent oil is used rather than a 3 percent oil. Application just before the leaves appear is more effective than when applied while the buds are dormant. If necessary to apply an emergency spray against the mites during the summer months use of a rotenone spray with summer oil or a good sticker is recommended. It is pointed out that ground derris root (5 percent rotenone) can be used at 2.5 lb. per 100 gal. plus 0.5 percent oil or a good sticker.

Antricola new genus, Amblyomma gertschi new species, and notes on Ixodes spinipalpis (Acarina: Ixodoidea), R. A. COOLEY and G. M. KOHLS (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 46, pp. 1733-1736, pl. 1, fig. 1).

Notes on the biology, toxicity, and breeding of Ixodes holocyclus (Neumann), D. T. OXER and C. L. RICARDO (*Austral. Vet. Jour.*, 18 (1942), No. 5, pp. 194-199).—Observations of the toxicity of larvae of *I. holocyclus* as well as that of the nymphs are reported. Under laboratory conditions larvae were kept alive for 162 days and nymphs for 275 days. These periods are considered to be longer than any previously recorded for the viability of larvae and nymphs. Several dogs were actively immunized against the adult tick. A brief description is given of methods adopted for the rearing of ticks.

The microbial flora of the Rocky Mountain wood tick *Dermacentor andersoni* Stiles, E. A. STEINHAUS (*Jour. Bact.*, 44 (1942), No. 4, pp. 397-404).—A study of the internal microbial flora of 2,502 specimens of *D. andersoni*, obtained from various sources, yielded 77 strains of bacteria, 2 of yeasts, at least 1 rickettsia (that of Rocky Mountain spotted fever), 1 rickettsialike organism, and 1 strain of bacteriophage. No acidfast bacteria, molds, spirochaetes or motile protozoa were observed in any of the ticks examined. Each of the 77 strains of bacteria was studied in detail with respect to their cultural, morphologic, physiologic, and pathogenic characteristics. Of 2,018 unfed adult ticks, only 1.6 percent harbored bacteria, but of 486 recently fed ticks, bacteria were found in a minimum percentage of 9.1. One possible explanation of the greater number of bacteria in recently fed ticks is the experimental finding that feeding ticks can ingest bacteria from the surface of skin to which they are attached.

ANIMAL PRODUCTION

The design of animal husbandry experiments, E. W. CRAMPTON (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 263-276).—Attention is called to the importance of design in setting up animal husbandry experiments to make it possible through variance analysis to get answers to more problems with fewer animals than would be necessary if single factor designs were set up. A multiple factor arrangement has the advantage of greater comprehensiveness. An example with six primary treatments on high and low protein rations with and without fish meal for winter and summer pigs of the two sexes, and with and without yeast and skim milk fed separately and combined, is presented. The maximum loss in precision from a single factor design was calculated at about 1 percent. Examples of uses of variance analysis for digestion, feeding, and other trials are presented. The number of independent variables which may be studied by this method is limited only by practical considerations of time and the facilities required for the calculations.

[Abstracts of papers on livestock production and feeding for the thirty-fifth annual meeting of the American Society of Animal Production] (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 345-346, 349-350, 351-352, 353-358, 358, 359-360).—The following papers were summarized:

Effect of Supplying Phosphorus to Cattle, Grazing a Phosphorus-Deficient Range, Upon Beef Production, by W. H. Black, N. R. Ellis, and J. M. Jones (p. 345) (U. S. D. A. and Tex. Expt. Sta.); Relationship of Milk Production of Milking Shorthorn Dams to the Carcass Quality of Their Steer Progeny, by A. C. Cook, W. H. Black, B. Knapp, Jr., and R. W. Phillips (p. 345), The Muscle-Bone Ratio as an Index of Merit in Beef and Dual-Purpose Cattle, by O. G. Hankins, B. Knapp, Jr., and R. W. Phillips (p. 351), Ear Measurements in Relation to Pelt Thickness and Fur Characters of Karakul Lambs, by J. I. Hardy and V. L. Simmons (p. 356), Fineness of Fiber in Eight Sampling Areas on Yearling Rambouillet Ewes, by E. M. Pohle and R. G. Schott (p. 356), Clean Wool Yield Variation Among Regions of Rambouillet Fleeces, by E. M. Pohle, H. W. Wolf, and C. E. Terrill (pp. 356-357), Estimation of Clean Fleece Weight From Unscoured Fleece Weight and Staple Length, by C. E. Terrill, E. M. Pohle, and L. O. Emik (p. 357), A Study of the Fiber Density of the Fleeces of Rambouillet Sheep, by H. W. Wolf, W. M. Dawson, and E. M. Pohle (pp. 357-358), The Value of Legume Hays in the Rations of Fall Farrowed Pigs, by N. R. Ellis, J. H. Zeller, and J. X. King (p. 358), and The Relation Between Growth Rates, Weights and Scores for Pigs at Market Maturity, by A. E. Molln (pp. 359-360) (all U. S. D. A.); The Laxative Nature of Soybean Oilmeal in Rations for Fattening Cattle, by I. F. Edwards, R. R. Snapp, and W. E. Carroll (pp. 345-346), Using Protein Supplements as a Partial Substitute for Corn in the Rations of Fattening Cattle, by F. C. Francis and W. E. Carroll (p. 346), and Distillers' By-Products in Swine Rations, by J. L. Kridler, B. W. Fairbanks, and W. E. Carroll (p. 359) (all Ill. Sta.); Comparison of Protein Supplements for Yearling Steers, by R. B. Hinman, F. B. Morrison, J. I. Miller, C. S. Hobbs, and J. J. Wanderstock (p. 346), and The Relative Efficiency for Ruminants of the Protein Furnished by Common Protein Supplements, by J. I. Miller and F. B. Morrison (p. 353) (both Cornell Univ.); The "Penny-A-Pig" Program, by E. F. Ferrin (pp. 349-350) (Minn. Sta.); Measuring Results in Extension Work, by E. T. Robbins (p. 350) (Univ. Ill.); Factors Effecting Farm Horse Power Efficiency, by R. S. Hudson and L. H. Blakeslee (p. 350) (Mich. Sta. Col.); The Relation of Ultra-Violet Light and Temperature During Aging on Quality of Beef, by M. E. Enslinger, J. Sotola, J. A. McIntosh, C. C. Prouty, and J. Roberts (p. 351), and Fiber Diameter Studies of Different Body Areas, by M. E. Enslinger (pp. 355-

356) (both Wash. State Col.); The Preparation of Muscular Tissues for Histological Study in Normal and Frozen Meat, by E. Johnson, F. N. Andrews, and C. L. Shrewsbury (pp. 351-352) (Purdue Univ.); The Effect of Fasting on the Yield and Carcass Grade of Spring Lambs, by C. M. Kincaid (p. 352) (Va. Sta.); The Effect of Diet on Brood Sow Performance, by O. B. Ross, P. H. Phillips, and G. Bohstedt (p. 353) (Univ. Wis.); The Experimental Design Necessary to Obtain Relative Net Energy Values From Group Feeding Experiments Has Proved to Have Several Advantages, by B. R. Taylor and W. L. Blizzard (pp. 353-354), and Some Factors Encountered in Evaluating Feeds For Fattening Lambs From Feeding Experiments, by H. M. Briggs (p. 355) (both Okla. Sta.); The Digestible Nutrients in Bluegrass Molasses, Alfalfa-Molasses and Corn Silages, by R. B. Hallmark and W. P. Garrigus (p. 354) (Univ. Ky.); Pasture Adjustments in the War, by R. H. Lush (pp. 354-355); Chemical Composition, Grazing Value, and Vegetative Changes of Herbage in a Typical Plains Pasture, by W. N. McMillen, Q. Williams, and W. Langham (p. 355); Vitamins Required by Growing Pigs, by V. F. McRoberts and A. G. Hogan (p. 359) (Univ. Mo.); and Studies in Feeding Soybeans to Pigs, by W. J. Peterson, E. H. Hostetler, and A. O. Shaw (p. 360) (N. C. Sta.).

[Investigations with livestock by the North Carolina Station] (*North Carolina Sta. Rpt. 1941*, pp. 51-53, 54-56, figs. 2).—Brief results are reported on forest grazing with beef cattle; cottonseed meal proving a profitable supplement to reeds for finishing yearling steers; cottonseed meal as a more profitable supplement than corn for wintering beef cattle; creep-feeding for beef calves; tankage, peanut meal, and fish meal as supplements to corn for fattening pigs; minerals with hogged down soybeans; native ewes of Hampshire breeding more profitable than western ewes of Rambouillet-Hampshire crossing for lamb production; and a mineral mixture to increase lamb production for Hampshire ewes.

New developments in bovine and poultry nutrition. R. M. BETHEKE. (Ohio Expt. Sta.). (*North Amer. Vet.*, 23 (1942), No. 9, pp. 580-583).—Developments in the nutrition of cattle and chicks are briefly reviewed.

The fluorine problem in livestock feeding. H. H. MITCHELL. [Ill. Expt. Sta.]. (*Natl. Res. Council, Reprint and Cir. Ser.*, No. 113 (1942), pp. [2]+10).—The Committee on Animal Nutrition of the National Research Council recommended that the permissible levels of fluorine in the total dry feed be considered tentatively as 0.003 percent for cattle, sheep, and swine, and 0.01 for chickens. In the total grain rations for cattle and sheep there were recommended 0.004 and 0.006 percent, respectively. The levels are based on the results of other investigators, of which an extensive bibliography is presented. These suggestions allow for a considerable margin to take account of individuality in reactions and length of time over which the fluorine is fed.

Vitamins for livestock. A. G. HOGAN (*Missouri Sta. Bul.* 453 (1942), pp. 23, figs. 6).—There are compiled the vitamin requirements of the various classes of livestock and poultry, including the various sources of vitamins A, D, thiamin, riboflavin, niacin, and choline in the several feeding stuffs, and the amounts of these feeding stuffs needed to supply vitamins for the several classes of animals.

Length of feeding period and number of animals required to measure economy of gain in progeny tests of beef bulls. B. KNAPP, JR., R. W. PHILLIPS, W. H. BLACK, and R. T. CLARK. (U. S. D. A. and Mont. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 285-292, figs. 2).—Data on the efficiency of gains of 62 individually fed steers sired by 3 purebred Hereford bulls from purebred and high grade Hereford cows showed that a feeding period of 168 days was sufficient to indicate differences between progeny groups provided the data were adjusted to differences in the initial weights. These findings were based on an

analysis by variance and covariance methods. The slope of the mean weight and efficiency analyzed by least squares showed that five to six 28-day periods were needed. Differences in initial weight of 100 lb. were responsible for affecting one market grade, and differences of 100 lb. in total gains caused two-thirds of a market grade change. The first 8 progeny of a bull were considered to indicate his ability to transmit efficiency of feed utilization, and little additional information was gained from records on further progeny.

Non-randomness of variations in daily weights of cattle, G. A. BAKER and H. R. GUILBERT. (Univ. Calif.). (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 293-299, fig. 1).—Daily weights in two periods of 33 and 32 days each, of seven heifers and one steer and fed on a ration of alfalfa hay, rolled barley, raisin pulp, and cottonseed meal, showed that when free access was allowed to feed and water there was a positive correlation between deviations in the daily weights and the environmental temperature, but when water was limited at night there was no correlation with variations and daily temperatures. The studies indicated that in feeding trials adequate adjustment periods are necessary, and that in experiments weighing of more rather than less animals at the same time of day increased the accuracy.

Cattle for the Tropics, A. O. RHOD (U. S. Dept. Agr., Off. Foreign Agr. Relat., *Agr. in Americas*, 2 (1942), No. 12, pp. 229-231, figs. 2).—A review of progress and expected development of cattle in the warmer climates for beef and milk production.

The influence of feeding low-nitrogen rations on the reliability of biological values, J. I. MILLER and F. B. MORRISON. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 9, pp. 429-451, figs. 6).—Data were supplied in three nitrogen balance experiments with 14 wether lambs. Methods employed in previous investigations (E. S. R., 81, p. 92) were employed. There were used high- and low-nitrogen rations which included dried skim milk, linseed meal, soybean meal, corn gluten meal, alfalfa hay, and timothy hay. It was apparent that a preliminary period of 10-12 days was sufficient for lambs to reach a more or less stable level of urinary and fecal nitrogen excretion on a low-protein ration. The additions of about 10 percent protein to low-protein rations of about 2.75 percent increased palatability and resulted in less loss of body weight. When dried skim milk was fed with or without linseed meal, urinary nitrogen losses were greater than when fed with the basal ration alone. The nitrogen of the dried skim milk did not appear to be completely utilized at the low nitrogen levels, but the fecal nitrogen showed it to be completely digested and that it did not affect the metabolic nitrogen losses. For about 30 days following a low-nitrogen feeding period of 20 days, nitrogen was more efficiently utilized but the protein was less well digested. Biological values were generally higher after a low-nitrogen period than were obtained by the same lambs prior to the low-nitrogen period.

The effect of adding large amounts of cottonseed meal to a lamb fattening ration, H. M. BRIGGS and V. G. HELLER. (Okla. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 277-284).—Digestion trials with 16 wether lambs on rations similar to those employed (E. S. R., 87, p. 101) showed for rations with the higher content of cottonseed meal a greater protein digestion coefficient, 77.3 percent as an average for three periods, as contrasted with 73.7 percent for rations containing the smaller amounts of cottonseed meal. There was also a greater digestibility of the nitrogen-free extract and fiber with lower cottonseed meal rations. Positive balances of calcium, phosphorus, magnesium, and nitrogen were obtained with both types of rations, resulting in

phosphorus storage but a reduction in calcium storage. Nitrogen intake was above what might be considered optimum levels.

Measures of growth rate for use in swine selection, R. E. COMSTOCK, L. M. WINTERS, P. S. JORDAN, and O. M. KISER. (Minn. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 8, pp. 379-389, fig. 1).—The average weekly gain of 203 suckling pigs in connection with the Regional Swine Breeding Laboratory investigations was shown to fluctuate from a regular weekly increase during 8 weeks. It is assumed that the suckling pigs suffered from a nutritional limitation after 6 weeks, regardless of the theoretical increase in milk production after this time. These data and other literature indicate that weaning weight is but slightly dependent on the pigs' genotype. Supplemental feeding prior to weaning makes the weaning weight a better measure of hereditary ability to grow. Correlations of the weaning weight with the rate of gain from weaning to 200 lb. (y) and the rate of gain from 50 to 200 lb. (y_1) are discussed. The results indicate that y is biased in favor of heavy weaning pigs and y_1 in favor of light weaners. By the use of intrasire regressions of offspring on dam the heritability of y , y_1 , weaning weight, and 180-day weight is estimated, and the postweaning growth rates were more heritable than the other two characters. It is tentatively concluded that y would be more useful in selection for growth rate than y_1 , since the former favors heavy weaning weights. This is a desirable but not highly heritable character.

Vitamin B₆ (pyridoxine) in the nutrition of the pig, E. H. HUGHES and R. L. SQUIBB. (Univ. Calif.). (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 320-325, figs. 2).—Fits were produced in pigs when kept on floors free of molds and yeasts and supplied with diets deficient in vitamin B₆ as used by Chick et al. (E. S. R., 82, p. 663). When these pigs were given 5 mg. of synthetic pyridoxin per 100 lb. live weight they made normal gains and returned to normal blood hemoglobin and normal healthy condition. The requirement of young pigs for pyridoxin hydrochloride was thus estimated as between 0 and 5 mg. per 100 lb. live weight. The results were based on three experiments with 24 pigs about 30 lb. in weight, one half of which were on deficient diets and the other half served as controls. In two of the experiments deficient symptoms were not apparent because of contamination from molds and yeasts.

Nutritional inadequacy of beet molasses rations for swine, R. A. RASMUSSEN, H. H. SMITH, R. W. PHILLIPS, and T. J. CUNHA (*Utah Sta. Bul.* 302 (1942), pp. 22, figs. 6).—A more detailed report (E. S. R., 87, p. 259) is given of studies with 182 pigs in which as little as 15 percent of beet molasses resulted in a nutritional disease when fed to pigs under 100 lb. live weight. When as much as nearly 40 percent was fed to pigs weighing approximately 100 lb. or over the disease did not develop.

Smoked meats.—I, Bacteriological, chemical, and physical measurements on smoked and unsmoked bacon, W. H. WHITE, N. E. GIBBONS, A. H. WOODCOCK, and W. H. COOK (*Canad. Jour. Res.*, 20 (1942), No. 9, Sect. D, pp. 263-275, figs. 2).—Smoking Wiltshire bacon was found to improve the quality and color and reduce the number of surface bacteria developing in storage. The study was conducted with right and left bacon sides from seven hogs subjected to cures and pumping with 30, 25, and 20 percent brines with and without nitrate. Samples were smoked immediately after pickling and others were held 10 days before smoking to simulate transportation. All were stored at -9.4° C. Chemical and bacteriological examinations of the pickles and the development of fat rancidity were reported with results analyzed by variance.

Rations and methods of feeding Rhode Island Red pullets, D. C. KENNAED and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul.* 219 (1942), pp. 165-171).—The

protein, mineral, and vitamin requirements of hens were shown to vary with production and body needs, and therefore free choice feeding of whole grain and mash permitted layers to satisfy individual differences and requirements. In the studies there were 5 groups of 42 Rhode Island Red pullets fed 10 mo. on rations with whole corn and oats and 24 and 32 percent protein mash supplements, or 17 percent protein mash supplements with and without skim milk powder. Slightly the best egg production and the lowest mortality and feed costs were produced by the group receiving whole oats and a 17-percent protein mash without milk products. Some feather picking and cannibalism occurred in those receiving whole oats and corn.

The protein value of Alaska pea meal for chickens, J. S. CARVER, B. B. BOHREN, and J. W. COOK. (*Washington Sta. Bul.* 418 (1942), pp. 16).—It was found that Alaska pea meal could replace 40–50 percent of the herring fish meal in the protein concentrate of chick starters or laying mashes containing 11 and 18 percent protein, respectively. The experiment with the chicks was based on gains of 10 lots of 25 chicks each fed in duplicate over a 2-week period following a 2-week depletion period (*E. S. R.*, 85, p. 384). In the study with laying birds there were five rations fed to 39 hens in duplicate over a 280-day period. As good results in egg production were obtained with pea meal as with 45.6 percent soybean meal and 54.4 percent fish meal protein. There were no significant differences in feed consumption, mortality, egg weight, or quality as a result of feeding pea meal and fish meal 30:70 to equal parts of the proteins.

Feeding-cane molasses as a constituent of poultry rations.—II, Molasses for adult chickens, W. H. OTT, R. V. BOUCHER, and H. C. KNANDEL. (*Pa. Expt. Sta.*). (*Poultry Sci.*, 21 (1942), No. 6, pp. 536–539).—Statistical analyses of the egg production, hatchability, and body weights of over 550 hens continued (*E. S. R.*, 87, p. 838) on rations containing 0, 2, 4, and 6 percent cane molasses from 24 to 72 weeks of age showed no significant differences in performance in the first or second generations. The relative cost of yellow corn and feeding-cane molasses seems to be the determining factor in the relative use of these feeds.

Dietary factors affecting feather growth, H. L. FULLER and H. L. WILCKE. (*Iowa Expt. Sta.*). (*Poultry Sci.*, 21 (1942), No. 6, pp. 540–547, figs. 5).—In an attempt to determine whether or not the effect of wheat bran and oat hulls in accelerating the rate of feather growth was simply the result of improved general growth, and to attempt to isolate a factor or factors responsible (*E. S. R.*, 84, p. 803), water-extracted and autoclaved wheat bran and oat hulls and the water extract were added to basal rations consisting mainly of oat groats for 38 lots of 16–20 New Hampshire or Barred Plymouth Rock chicks. The New Hampshires were fed to 6 weeks and the Barred Plymouth Rocks 8–10 weeks of age. The lots receiving untreated oat hulls or wheat bran were the fastest feathering groups, followed closely by those receiving heated oat hulls or water extract of oat hulls. The slowest feathering groups were those receiving oat groats, sawdust, and water-extracted oat hulls. The rapid feathering chicks were usually the heaviest in body weights. The analysis by variance showed heated and untreated oat hulls to give the most rapid feather growth of New Hampshires, while autoclaved oat hulls gave the best growth in body weight. Considerable plumage abnormalities occurred in birds receiving water extract of oat hulls and sawdust. The evidence indicated that separate factors were involved in normal feather structure and normal pigmentation in the Barred Plymouth Rock chick. Only the factor or factors necessary for normal pigmentation was destroyed by autoclaving. It was not removed from oat hulls by successive water extractions.

The effect of the diet of the hen on the shank color of her day-old chicks, J. C. HAMMOND, D. MILLER, and D. WHITSON. (*U. S. D. A.*). (*Poultry Sci.*,

21 (1942), No. 6, pp. 525-527).—The inclusion of 3 percent of fortified cod-liver oil in the diet of laying hens interfered with the transfer of the pigment from the diet, through the eggs, to the shanks of the chicks. The average shank score (E. S. R., 86, p. 230) was 0.68 as contrasted with 2 or over in chicks from eggs of hens on rations containing 14 percent crude soybean oil, alfalfa leaf meal, soybean meal, and peanut meal. In another experiment shank color score was also reduced by the inclusion of 0.25 percent and 0.5 percent flowers of sulfur. The experiments were conducted with lots containing 50 pullets each.

Hatchability in relation to the fat content of the diet, B. W. HEYWANG. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 521-524).—In two experiments with 200 laying White Leghorn pullets, there were no significant differences in the hatchability of the eggs or the mortality of the chicks produced with diets containing less than 1 percent fat or when 2, 4, and 8 percent of ground rice in the basal ration was replaced by equivalent amounts of corn oil. Thus, no statistical significance could be attributed to differences in the fat content of the diets.

Evidence of new growth factors for chicks, E. L. JOHNSON, C. W. CARRICK, R. E. ROBERTS, and S. M. HAUGE. (Ind. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 566-570).—Evidence is presented to indicate that there is a factor or factors present in casein or liver meal, essential for growth of chicks, but distinct from vitamin A, thiamin, riboflavin, nicotinic acid, pantothenic acid, para-aminobenzoic acid, choline, and pyridoxin. This factor was soluble in ether and ethanol and was thermostable. The study was conducted in three experiments with 8 lots of about 20 ♂ and ♀ chicks each fed for 8 weeks with selection for reduced viability in the second and third experiments. These studies were conducted by the use of supplements of casein untreated and treated with ether and ethanol, liver meal, and the purified products. The results showed the best growth to occur to an average of 8 weeks of age in ♂s when liver meal was added to the ration.

Cow manure as a source of certain vitamins for growing chickens, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 554-559, fig. 1).—Additions of a carefully dried cow manure to a low grade diet improved the growth of chicks up to 6 weeks of age but had no influence on the growth of chicks fed a high grade diet. Cow manure contains a factor that stimulates comb growth in ♂s and ♀s. Similar benefits were produced by alcohol extracts but not by water extracts. The experiment was conducted with 24 lots of 25 chicks each. No undesirable odors or flavors were detected in the meat.

Riboflavin in rations for poultry, B. W. FAIRBANKS and T. S. HAMILTON. (Univ. Ill.). (*North Amer. Vet.*, 23 (1942), No. 9, pp. 575-578).—A review is given of riboflavin effects and the results of deficiencies in poultry. The riboflavin contents are given for several of the more common ingredients of the poultry ration, together with the amounts of each feed per 100 lb. of the ration required to furnish 25 percent of the riboflavin needed by growing chicks.

The comparative vitamin D requirements of White Leghorn and cross-bred chicks, V. HELMAN and L. W. TIGHE (*Poultry Sci.*, 21 (1942), No. 6, pp. 511-514, figs. 2).—In a comparison of the vitamin D requirements of growing White Leghorn chicks with more rapidly growing Barred Plymouth Rock ♂ × Rhode Island Red ♀ crossbreds, both types were found to require approximately 50 A. O. A. C. units of vitamin D per 100 gm. of the chick ration to 5 weeks of age. In the conduct of the study 240 chicks of each type were fed in duplicate lots, supplying 0, 10, 20, 30, 40, and 50 units of vitamin D per 100 gm. of the diet.

Further data on the relation between shell strength, potential hatchability and chick viability in the fowl, S. S. MUNRO (*Sci. Agr.*, 22 (1942), No.

11, pp. 698-704).—Differences in the specific gravity of eggs between flocks did not serve as reliable indices of hatchability, but within flocks the differences were generally related to the hatching power of the eggs. There was also a higher mortality of chicks from eggs with lower specific gravity than was found in the flock as a whole. This was a further study (E. S. R., 84, p. 515) carried out on over 15,000 eggs produced at eight farms, and showed the peculiarities of eggs from each farm and the possibilities of environmental effects.

Acorns one cause of olive-colored yolks, M. W. OLSEN. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 497-499).—Single-Comb White Leghorn hens confined to individual cages and fed rations containing 25-50 percent ground acorn meats, 25 percent ground acorn hulls, and 25 percent whole acorns from white oaks produced eggs with olive yolks after 4-5 days' feeding. Similar results were obtained on yolk color when whole acorns from black oaks were fed. Of 58 eggs with olive yolks 60 percent of the fertile eggs hatched, whereas 79 percent of fertile eggs with yellow yolks developed normally.

Some studies of leg bone deformities in turkeys, H. M. NIELSEN and D. E. MADSEN. (Utah Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 500-504, fig. 1).—In investigations with turkey poults low manganese rations did not cause perosis. These studies were conducted with 137 poults divided into lots of about 15 each, one half of which were started at 8 weeks of age and the other half at 14 weeks of age on rations of high calcium and phosphorus with low and normal manganese rations. Normal amounts of calcium and phosphorus were employed. The blood phosphatase analyzed by variance showed that a significant increase occurred with perosis. There were three cases of bone deformity among 17 birds on the standard ration with 6 percent bonemeal. These rations also contained 34.2 mg. manganese per kilogram. Up to 31 weeks of age increases were the least in the groups receiving bonemeal. Blood acid soluble phosphorus and inorganic phosphorus in the plasma were not significantly different in any of the lots.

The effect of age and weight of turkey eggs on the length of the incubation period, M. W. OLSEN. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 532-535, figs. 2).—Study of the incubation period of 3,376 turkey eggs at 99.5°-100° F. showed that there was a variation from 25¼ to 28 days. A maximum of 5 hr. of this variation was attributed to egg weight. The average initial egg weight classes of 70-80 gm. required for incubation 637.6 hr., 80-90 gm. 639.8, and 90-100 gm. 641.6 hr. The incubation period was not influenced by the length of the storage period of 1-16 days at 55° prior to the incubation period.

DAIRY FARMING—DAIRYING

[Abstracts of papers on dairy cattle, production, and feeding for the thirty-fifth annual meeting of the American Society of Animal Production] (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 347-348, 348-349, 352-353).—Results of the following studies are presented: The Evaluation of Grass Silage as a Succulent Feed, by C. B. Bender (pp. 347-348), and Can One Predict the Average Fat Test for a Lactation Period on the Basis of an Incomplete Record? by R. P. Reece (p. 349) (both N. J. Expt. Stas.); The Replacement Value of Cottonseed Meal in a Good Dairy Ration, by A. H. Kuhlman and W. D. Gallup (p. 348) (Okla. A. and M. Col.); and A Method of Equalized Feeding for Use in Lactation Studies With Dairy Cows, by H. L. Lucas and L. A. Maynard (pp. 348-349), and A Study of the Effect of Dietary Fat and the Fat Soluble Vitamins Upon Milk and Fat Production, by J. K. Loosli and H. L. Lucas (pp. 352-353) (both Cornell Univ.).

Material presented at the Dairy Technology Conference, 1942 (Columbus: Ohio State Univ., 1942, pp. [1]+IV+78).—Abstracts on the following subjects were presented: New Developments in Dairy Cattle Feeding, by C. F. Monroe (pp. 1-2), and The Place of Milk in the National Defense Program, by W. E. Krauss (pp. 3-4) (both Ohio Expt. Sta.); Short-Time High-Temperature Pasteurization, by P. C. Stoltz (pp. 5-9); Relation of Thermophilic Bacteria to Pasteurization, by F. W. Fabian (pp. 10-11) (Mich. State Col.); The Applications of the Newer Phosphates in Dairy Operations, by C. T. Roland (pp. 12-15); The Wetting Agents—Their Properties and Applications, by F. M. Scales and M. Kemp (pp. 16-19); Homogenization, by A. W. Farrall (pp. 20-24); A Neglected Phase of Frozen Desserts Sanitation, by F. W. Fabian (pp. 25-26) (Mich. State Col.); The Butter Industry of Tomorrow, by N. R. Baker (pp. 27-30); New Frontiers in Dairy Sanitation, by M. E. Parker (pp. 31-34); Effective Can Washing, by V. Schwarzkopf (pp. 35-36); The Path to Quality, by M. E. Parker (p. 37); Milk Control Laws From the Public Health Standpoint, by M. J. Dotter (pp. 38-41); A Summary of State-Wide Dairy Products Scoring for 1941, by T. V. Armstrong (pp. 42-46) (Ohio State Univ.); Organizing the Work of the Fieldman, From the Viewpoint of Quality Improvement, by E. H. Parfitt (pp. 47-48); Chocolate Milk in the Dairy Industry, by R. A. Larson (pp. 49-50); Methods of Platform Inspection, by J. T. Smith (pp. 51-55); The Relationship of Nutrition to Animal Disease, by T. S. Sutton (pp. 56-58), and Sweetening Agents for Use in Ice Cream, by J. H. Erb (pp. 59-63) (all Ohio State Univ.); The Manufacture, Curing, and Merchandising of American Cheddar Cheese in Valve-Vented Cans, by H. L. Wilson (p. 64) (U. S. D. A.); and Recent Research on Shrinkage in Ice Cream, by J. H. Erb (pp. 65-67), Factors Affecting the Mold Mycelia Count of Butter, by W. L. Slatter (pp. 68-70), Vocational Agriculture and the Fieldman, by J. B. Clinch (pp. 71-73), Diabetic Ice Cream, by H. G. Nelson (pp. 74-76); and The Resazurin Test, by L. H. Burgwald (pp. 77-78) (all Ohio State Univ.).

[Experiments in producing and feeding of dairy cattle] (*North Carolina Sta. Rpt. 1941, pp. 53-54, fig. 1*).—Results are briefly reported on investigations of mastitis as the more important dairymen's problem; small grain-legume silage mixture as a satisfactory silage for yields; and limestone and phosphate for increasing vitamin A content of pastures.

[Investigations with dairy products and dairy cattle by the Vermont Station] (*Vermont Sta. Bul. 495 (1942), pp. 21-22, 23-24*).—Results by H. B. Ellenberger are briefly presented on the efficiency of fat removal by milk and dairy plants; variations in the calcium and phosphorus contents of milk samples with season of production and stage of lactation; relation of vitamin consumption and hay quality to total digestible nutrients required and growth of heifers and their calves; and role of frequency in use of sire, sperm motility, pH of vaginal fluid, sodium bicarbonate douche, and exercise of bull in artificial insemination of dairy cattle.

Age and weight changes in reaction-time of dairy cattle, E. B. BROADY. (Univ. Mo.). (*Growth, 6 (1942), No. 2, pp. 179-184, figs. 5*).—The reaction time of dairy cattle to an electric shock showed that the youngest and smallest animals reacted fastest. Differences in the reaction of the rat are assumed due to position and morphology (E. S. R., 85, p. 38). An apparatus for measuring reaction rates in large animals is described.

The digestibility and utilization by dairy cows of nutrients from fertilized and unfertilized bluegrass pasture, J. F. EHEART and A. D. PRATT (*Virginia Sta. Tech. Bul. 81 (1942), pp. 28, fig. 1*).—For practical purposes, herbage from unfertilized bluegrass pasture was found to meet the needs for milk production provided enough herbage was available to produce the energy

required to gather the herbage from the poor sod. However, the increased yield from fertilization justified such a practice. In connection with the study there were conducted in 1940 and 1941 a total of 14 digestion and balance trials of 5 days each with dairy cows producing an average of over 12,000 gm. of 4 percent milk per day. Analyses are reported of the nitrogen, carbohydrates, fats, and minerals consumed and found in the feces of the cows eating the fertilized and the unfertilized pasture grasses.

Wintering rations for cattle, R. R. THALMAN (*Nebraska Sta. Bul.* 343 [1942], pp. 44).—In several experiments with calves and heifers, comparisons were made of the feeding values of shelled corn, corn silage, and corn fodder in comparison with sorgo silage and whole and chopped sorgo fodder, alfalfa hay, cottonseed cake, tankage, soybean cubes, and limestone with cottonseed cake and molasses. Feeding these roughages with alfalfa hay or a little protein concentrate proved an economical method of utilizing and marketing the roughages. Slightly more gain was produced by an acre of corn silage than by an acre of fodder. Sorgo silage also proved more satisfactory than sorgo fodder. Corn silage and corn fodder were slightly superior to the sorgo products. Weedy silages had a diuretic effect. Limestone increased the average daily gains from corn silage and cottonseed cake, or sorgo silage and cottonseed cake. Older steers gained more rapidly than steer calves. Heifers made approximately the same gains during wintering as steers, but they were too fat for feeders and too thin for killing. Increased gains were produced with limited quantities of molasses.

Wartime rations for young calves, D. ESPE and C. Y. CANNON. [Iowa Expt. Sta.]. (*Holstein-Friesian World*, 39 (1942), No. 22, pp. 11, 61, figs. 2).—Holstein-Friesian calves from 3 to 9 weeks of age on reduced amounts of milk products fed a gruel of oatmeal and linseed meal made gains of 1 lb. per head per day. The low fiber in the oatmeal seemed to avoid scouring. Alfalfa hay was successfully fed to older calves with corn, oats, bran, and a protein concentrate, such as soybean meal.

The effect of number of daily milkings upon persistency of milk production, I. LUDWIN (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 300-308, fig. 1).—Persistency was increased by more frequent milking if a proportional measure of persistency was used, but when measured by actual rate of decline it was not affected by frequency of milking. A straight line relationship showed the decline in milk yield from the third to the ninth month. The study was made by comparison of persistency of 728 lactations of 364 cows, which were made at different frequencies of milking of 2, 3, or 4 times per day for entire lactations. Pairings were made from A. R. S. O. Holstein-Friesian records so that age, individuality, and herd environment were balanced and the same individual milked at different rates in 2 successive lactations, but with the order of frequency of milking reversed in the 2 cows of a pair in successive years.

Improved milk goats: A guide for breeders, dairymen, and exhibitors, W. L. TEWALT (*New York: Orange Judd Pub. Co.*, 1942, pp. 145, figs. 34).—This book gives descriptions and illustrations of the breeds of milk goats, with general directions for goat care and management.

Ripening cheese in cans, A. C. DAHLBERG and J. C. MARQUARDT (*New York State Sta. Tech. Bul.* 265 (1942), pp. 17).—Cheddar cheese from raw and pasteurized milk was packed in vented cans and under vacuum with ripening at 40°, 50°, and 60° F. Cheese ripened at 60° developed a good flavor in 2 mo., but colder temperatures interfered with flavor development and a longer time was required without developing full flavor. A good cheese flavor was produced in cheese packed under 7 and 22 in. of vacuum. There was a slight tallowiness at the surface when packed in vented cans under atmospheric conditions. When

less than 7 in. vacuum pressure was developed in the cans cheese from poor quality milk produced gas pressure in the cans, but cheese from the poorer quality milk could be stored and ripened for 2 mo. at 60° with 22 in. vacuum. The addition of 1 gm. of magnesium or calcium hydroxide per 12 oz. of cheese absorbed the gas, which was largely CO₂. A satisfactory vacuum was maintained in raw milk cheese for 4 mo. by the use of magnesium hydroxide and in pasteurized milk cheese for 8 mo. at 50°. Cheddar cheese was well ripened in vacuum packs and in the presence of hydroxide without developing gas pressure. Limburger, Brie, Tilsiter, and Camembert were best canned under vacuum.

Growth and enzyme activity of *Penicillium roqueforti*, R. THIRODEAU and H. MACY (Minnesota Sta. Tech. Bul. 152 (1942), pp. 56, figs. 10).—A study was made of the physical and chemical properties of the mycelium of *P. roqueforti* cultures from four sources and cheese produced after additions of mycelium to the cheese curd. It was concluded that additions of the enzymes of *P. roqueforti* as 6 gm. of mycelium per 5 lb. of blue cheese at the time of hooping produced cheeses of fine quality. Such cheese was ready for the trade in about 5 mo. as compared with 10 mo. for the normal product. Growth of *P. roqueforti* was poor on Czapek medium, and no pellicles were formed. Ranges of pH 4 to 7.5 in the media had no influence on the growth of four strains. As a source of carbon, sucrose seemed as satisfactory as glucose, lactose, and tributyrin and more satisfactory than ethyl acetate. The source of nitrogen had a marked influence on growth. The highest yields of mycelium were obtained when ammonium sulfate was the source of nitrogen. Organic sources were generally favorable for growth, although the pellicle was weak. Growth was stimulated to different degrees by solid materials in the media, such as cork, paraffin, and glass. With 0.1 percent agar in the media which decreased the oxidation potential below 400 mv., growth was favored. The requirement for abundant growth and the formation of a thick resistant felt were best met by the standard medium of sucrose 30 gm., sodium nitrate 1.75, dispotassium phosphate 1, magnesium sulfate 0.4, potassium chloride 0.5, ferrous sulfate 0.01, and agar 1 gm. in 1 l. of solution consisting of 950 cc. of water and 50 cc. of skim milk. In studies of the proteolysis of *P. roqueforti* it was found that only one protease of the trypsin type was produced over a wide pH range as ascertained by formol titration. The optimum activity of the enzyme on a 1-percent casein substrate was obtained between pH 5.8 and 6.3. For proteolysis studies a digestion period less than 20 hr. was recommended. With 3 percent of butter-oil or cottonseed-oil emulsions in an acetate buffer, optimum activity of lipase was obtained between pH 5.3 and 7.5. Sugar retarded but agar and organic nitrogen increased the production of both protease and lipase. Enzymatic activity varied from strain to strain, but protease activity was not retarded by sodium chloride concentrations up to 4 percent, and for lipase 6 percent of sodium chloride. The enzymes of *P. roqueforti* seemed to be tenaciously adsorbed by the cells, and release was beginning only after 30 days when disintegration had started. The nature of the enzymes produced was not clear. They were difficult to liberate and isolate from the mycelium. The protease of *P. roqueforti* was precipitated when the aqueous solution was half saturated with ammonium sulfate.

Using fruit purées to get new flavors in ribbon ice cream, D. K. TRESSLER (N. Y. State Expt. Sta.). (Food Indus., 14 (1942), No. 9, pp. 49-51, 99, fig. 1).—Recipes are given for the preparation of various pectinized fruit juices which have been successfully employed in experimental batches of ice cream.

VETERINARY MEDICINE

Animal sanitation and disease control, R. R. DYKSTRA (*Danville, Ill.: Interstail.* [1942], pp. 558, figs. 91; rev. in *Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 786, pp. 213-214).—The subject is treated in the several parts (51 chapters) of this work as follows: Some animal health factors (pp. 23-114), some animal disease factors (pp. 115-152), some methods of disease control (pp. 153-171), infections and their handling (pp. 172-216), external and internal parasites and their control (pp. 217-240), noninfectious, sporadic ailments (pp. 241-344), infectious and communicable ailments (pp. 345-415), some infectious and communicable ailments of barnyard fowl (pp. 416-443), parasites and disease (pp. 444-487), miscellaneous information (pp. 488-537), and livestock sanitary bureaus, boards, and commissions, and the veterinarian (pp. 538-546).

Textbook of clinical parasitology, including laboratory identification and technic, D. L. BELDING (*New York and London: D. Appleton-Century Co.*, [1942], pp. XXI+888, figs. 279).—Section 1 of this work is devoted to general parasitology (pp. 1-70), section 2 to the protozoa (pp. 71-222), section 3 the Nematelminthes or roundworms (pp. 223-386), section 4 the Cestoidea or tapeworms (pp. 387-454), section 5 the Trematoda or flukes (pp. 455-588), section 6 Arthropoda (pp. 589-768), and section 7 to technical methods for the diagnosis and treatment of parasitic infections (pp. 769-843). A bibliography is included (pp. 845-846).

Blood: A review of the recent literature, F. H. BETHELL, C. C. STURGIS, R. A. HERTIG, and O. T. MALLERY (*Arch. Int. Med.*, 69 (1942), Nos. 5, pp. 856-926; 6, pp. 1051-1126).—Presented with a list of 608 references to the literature reviewed.

Blood grouping technic: A manual for clinicians, serologists, anthropologists, and students of legal and military medicine, F. SCHIFF and W. C. BOYD (*New York: Interscience Pubs., Inc.*, 1942, pp. XIV+248, [pl. 1], figs. 45).—Following a foreword by K. Landsteiner and a preface by the junior author, who, following the death of the senior author, completed the work, (1) theoretical foundations (pp. 1-16), (2) general technic of blood group investigation (pp. 17-84), and (3) specific applications of blood grouping techniques (pp. 85-241), including directions for carrying out blood-grouping tests in selecting donors for transfusions, in connection with cases of disputed parentage, and other forensic applications and in anthropological studies, are presented. Eight sectional bibliographies are included.

Spontaneous and experimental leukaemia in animals, J. ENGELBRETH-HOLM (*Edinburgh: Oliver & Boyd*, 1942, pp. XXIII+245, figs. 44; rev. in *Science*, 96 (1942), No. 2484, pp. 136-138).—The five parts of this work deal with leukemia in birds and mammals, respectively, as follows: (1) Spontaneous leukemia in animals, (2) transmission experiments, (3) the role of heredity in animal leukemia, (4) attempts to produce leukemia experimentally, and (5) nature of the animal leukemias. A 25-page list of references to the literature is appended. The review is by J. Furth.

[**Contributions on livestock diseases**] (*Assoc. South. Agr. Workers Proc.*, 43 (1942), pp. 90, 109-111).—Contributions on livestock diseases and parasites presented at the annual convention of the Association of Southern Agricultural Workers held at Memphis, Tenn., in February 1942, abstracts of which are given, are: Internal Parasites of Cattle, by L. E. Swanson (p. 90) (Fla. Expt. Sta.); The Relation of Calftlood Vaccination to the Control of Bang's Disease, by W. E. Cotton (pp. 109-110) (Ala. Polytech. Inst.); and Calf Diarrhea, by G. H. Wise and G. W. Anderson (pp. 110-111) (S. C. Sta.).

The isolation of *Haplosporangium parvum* n. sp. from *Coccidioides immitis* from wild rodents—their relationship to coccidioidomycosis, C. W. EMMONS and L. I. ASHBURN (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 46, pp. 1715–1727, pls. 4, fig. 1).

Viability of *Brucella abortus* strain 19 in vaccine, C. A. MITCHELL and T. MOORE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 10, pp. 292–295).—In a study of the viability of four lots of *B. abortus* strain 19 vaccine, the details of which are given in tables, low temperature proved to be the most important factor in its preservation. It appears to be a factor in drying which rapidly brings about the death of micro-organisms. Although alkali-free vials may have some advantage over ordinary vials in the preservation of viability, this advantage does not appear to be marked.

Further experiments on accessory growth factor requirements of the *Brucella* group, S. A. KOSER and M. H. WRIGHT (*Jour. Infect. Diseases*, 71 (1942), No. 1, pp. 86–88).—The findings reported confirm the earlier conclusion of Koser et al. (*E. S. R.*, 87, p. 109) that biotin is needed for certain *Brucella* cultures. Both pure biotin and biotin methyl ester replaced the growth-promoting property of biotin concentrate. Extremely small amounts of pure biotin supported growth; 0.0001 $\mu\text{g.}$ per cubic centimeter of medium produced about 90 percent of maximum growth, 0.00001 $\mu\text{g.}$ supported approximately half maximum, and 0.000003 $\mu\text{g.}$ was sufficient for light growth. The cultures were carried through successive transplants in the presence of 0.00001 $\mu\text{g.}$ per cubic centimeter of biotin or biotin methyl ester in the presence of larger quantities of nicotinamide, pantothenic acid, and thiamin. The pyrimidine but not the thiazole component of thiamin was required for all seven of the *Brucella* cultures.

Immunity in brucellosis, I. F. HUDDLESON. (Mich. Expt. Sta.). (*Bact. Rev.*, 6 (1942), No. 2, pp. 111–142).—This is a review, the principal purpose of which is to bring together many of the data that are related directly or indirectly to the state of active immunity to brucellosis in animals and man, to critically analyze the data as to their significance, and to point out the nature of the immunity. In summary, it is shown that in the bovine there appear to be two types of immunity, (1) a so-called “natural immunity” that functions in young animals up to or near the beginning of ovulation and (2) an acquired immunity which usually develops in unbred heifers and cows, requiring for its stimulus the presence of live organisms in the body or the injection of a labile immunogenic constituent of the bacterial cell. When virulent organisms enter the body of young animals under natural conditions or are injected in small numbers they remain for only a short time and cause little, if any, reaction on the part of the tissues. Only when large numbers of organisms are injected is sufficient reaction provoked to cause the appearance of serum antibodies in a high titer, and even then such antibodies persist for only a short time. A large percentage of normal nonpregnant heifers and cows when exposed to *Brucella* infective material instead of becoming actively infected develop a high degree of active immunity against subsequent exposures. From the small amount of data now available it would appear that the immunity acquired through the infective process persists for more than 5 yr.

“From the facts now available it may be stated categorically that the possibility of animals and human beings acquiring an active immunity to brucellosis through infection is no longer a hypothesis but a demonstrated fact. There is now conclusive proof that an active immunity can be established in adult cattle against brucellosis by injecting them as calves with live *B. abortus*, the vaccine being prepared from a culture of low virulence. The duration of the immunity produced in this manner has not been determined conclusively. Al-

though it seems highly probable that human beings could be immunized against brucellosis, there is up to the present time no convincing proof that an agent for this purpose has been developed. The possibility of an active immunity occurring in swine to *B. suis*, the infecting species, has not been considered in this review due to the fact that no information is available. Very little is known even about the course of the disease under natural conditions. It has long been recognized that swine brucellosis is an important economic disease, and that the infected hog is a reservoir from which the disease is acquired by human beings and other animals. The well-planned research programs on swine brucellosis now being undertaken at Federal and State experiment stations, if continued, should furnish information on the course of the disease and its immunological aspects that is now so badly needed.

"Since there are three known species of *Brucella*, and each may infect species of animals other than the one in which each is commonly found, it would seem essential to the successful application of measures to control the disease to know whether recovery from an attack of one species of *Brucella*, or vaccinal immunization with one species, will afford protection against the other species. In the case of human beings it has been observed repeatedly in many laboratories that those who have developed an immunity as a result of a clinical or subclinical infection with one species may freely work with the others without becoming infected. This observation has been made so many times in several laboratories that it now seems certain that an immunity which is produced by one species will protect against an infection by the other two. There are also experimental data which show that the guinea pig can be immunized against *B. abortus* infection by treatment with the crushed cell fraction derived from *B. suis* as well as from *B. abortus*."

A four-page list of references to the literature cited is included.

In vitro studies of sulfonamide action on organisms of the *Brucella* group and the counteracting effect of para-aminobenzoic acid. B. WISE (*Jour. Pharmacol. and Expt. Ther.*, 76 (1942), No. 2, pp. 156-160, figs. 3).—"Comparison of the bacteriostatic action of sulfathiazole, sulfadiazine, and sulfaguanidine on seven *Brucella* strains has shown sulfathiazole and sulfadiazine to have almost the same effect. The bacteriostatic effect of sulfaguanidine is more variable and frequently much less marked than that of the other drugs. Sulfathiazole and sulfadiazine in increasing concentrations above 2.5 mg. percent exhibit very small or no differences in bacteriostatic action, whereas the bacteriostatic effect of sulfaguanidine frequently varies directly with the drug concentration. *p*-Aminobenzoic acid in concentrations of 0.1 and 1.0 mg. percent partially or almost completely inhibits the action of sulfathiazole. Organisms exposed to the action of sulfathiazole for 48 hr., then explanted to drug-free broth, show a continued inhibition of growth which is not due to 'carry-over' of sulfathiazole in the explants. This persisting inhibitory effect is counteracted by *p*-aminobenzoic acid."

An infectious agent from cases of atypical pneumonia apparently transmissible to cotton rats. M. D. EATON, G. MEIKELJOHN, W. VANIERICK, and J. C. TALBOT (*Science*, 96 (1942), No. 2501, pp. 518-519).

Studies in the epidemiology of Q fever.—X, The transmission of Q fever by the tick *Ixodes holocyclus*, with notes on tick-paralysis in bandicoots, D. J. W. SMITH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 20 (1942), No. 3, pp. 213-217).—In this further contribution (E. S. R., 88, p. 24, 1, *holocyclus* Neuma. was found to be a potential vector of Q fever, larval, nymphal, and adult ticks having been infected experimentally by feeding on infected laboratory animals. The virus was passed from larvae to nymphs and from nymphs to adults, but

not to their progeny. An infected adult tick infected a bandicoot upon which it fed.

A description of an unusual *Salmonella* type, with special reference to the evolution of *Salmonella* species, P. R. EDWARDS and D. W. BRUNER. (Ky. Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 3, pp. 289-300).—Description is given of a new *Salmonella* type, *S. salinatis*. The antigenic formula for this type is IV, XII . . . : d, c, h - d, c, n, z₁₅. Through cultivation of *S. salinatis* in semi-solid agar containing agglutinating serum for *Eberthella typhosa*, an organism having the antigenic formula IV, XII . . . : c, h - c, n, z₁₅ was isolated. The latter is biochemically and serologically indistinguishable from the Sandiego type. The bearing of these observations, and of previous experiments on induced variation, on White's theory of *Salmonella* phylogeny is discussed.

Observations on the somatic antigens of *Salmonella cholerae-suis* var. kunzendorf, J. T. HAYSTON (*Austral. Vet. Jour.*, 18 (1942), No. 4, pp. 172-174).

Prevention and treatment of agranulocytosis and leukopenia in rats given sulfanilylguanidine or succinyl sulfathiazole in purified diets, S. S. SPICER, F. S. DAFT, W. H. SEBELL, and L. L. ASHBURN (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 42, pp. 1559-1566, fig. 1).—In experimental work rats given sulfaguanidine (sulfanilylguanidine) or sulfasuxidine (succinyl sulfathiazole) in purified diets developed an agranulocytosis, a leukopenia, and a hypocellularity of bone marrow. This blood dyscrasia can largely be prevented or successfully treated with whole dried liver or with certain liver extracts. A list is given of 21 references to the literature cited.

Quantitative determination of the bacteriostatic effect of the sulfonamide drugs on pneumococci, C. M. MACLEOD and G. S. MIRICK (*Jour. Bact.*, 44 (1942), No. 3, pp. 277-287).

Derivatives of dithiocarbamic acid as pesticides, W. H. TISDALE and A. L. FLENNER (*Indus. and Engin. Chem.*, 34 (1942), No. 4, pp. 501-502).

Stock-poisoning plants of California, A. W. SAMPSON and H. E. MALMSTEN (*California Sta. Bul.* 593, rev. (1942), pp. 90, pls. 3, figs. 20).—A revised edition of this bulletin (E. S. R., 74, p. 396).

The poison plants of New South Wales, E. HURST (*Sydney: Snelling Pty. Works Pty.*, 1942, pp. XIV+498, [figs. 27]).—This work was compiled under the direction of the Poison Plants Committee of New South Wales. It is presented with a bibliography of 36 pages and a glossary of botanical and medical terms.

Tung tree (*Aleurites fordii* Hemsl.) foliage poisoning of cattle, D. A. SANDERS, M. W. EMMEL, and L. E. SWANSON (*Florida Sta. Bul.* 376 (1942), pp. 8, fig. 1).—Following a brief review of the literature, field observations on the toxicity of tung tree foliage, three experimental observations on tung tree foliage and one on castor-bean plant, and the microscopic pathology are considered. The work was projected following a loss in November 1941 of 14 purebred Hereford and Aberdeen-Angus cattle in a herd of 30 animals at pasture after they had eaten discarded green and partly cured leaf foliage from nursery stock of the tung tree. Several of the animals died within 3 to 4 days after onset of symptoms, and animals that survived for a longer period continued to refuse feed, developed a seropurulent nasal discharge, and drooled saliva. Further symptoms consisted of dyspnea, reddening and cracking of the skin of the muzzle, gritting of the teeth, drooped ears, and progressive emaciation. Affected animals remained lying down most of the time and showed considerable distress. Watery feces containing blood soiled the vulva, tail, and buttocks. All 14 animals succumbed within 4 weeks. A feeding experiment led to the conclusion that the castor-bean plant was not responsible for the losses which oc-

curred in this herd. It was shown in feeding experiments that even a small quantity of tung tree foliage is highly toxic and fatal to cattle.

Some factors influencing the toxicity of selenium, A. L. MOXON and H. D. ANDERSON. (S. Dak. Expt. Sta.). (*Amer. Chem. Soc. Mtg.*, 103 (1942), *Abs. Papers*, pp. 4A-5A).—Brief reference is made to the results of studies on the influence of various elements and compounds upon the toxicity of selenium that have extended over a period of several years. Using albino rats it was found that arsenic as sodium arsenite when fed at the rate of 5 p. p. m. in drinking water would counteract the toxicity of a diet containing 18 p. p. m. of selenium, and 10 p. p. m. of arsenic in the drinking water gave complete protection with this diet. Sodium arsenite was equally effective. The arsenic sulfides, AsS_2 and AsS_3 , were ineffective. Sodium arsenite was effective against selenium as seleniferous wheat, sodium selenite, and selenium-cystine. A diet containing from 12 to 15 p. p. m. of selenium caused death of dogs within 3 to 4 mo. Hatchability of eggs laid by hens fed a seleniferous ration is greatly reduced due to the high incidence of monstrosities. Arsenic used (25 p. p. m. in the salt) for cattle on a seleniferous ranch has shown promise as a preventive measure for the "alkali disease" or selenium poisoning in cattle in seleniferous areas. Certain proteins and protein concentrates have proved to be effective in preventing the toxic effects of seleniferous feeds. There are, however, species differences in the reactions of the proteins. Crude casein will protect rats against the toxic effects of selenium but will not protect dogs against the same amount or even lower amounts of selenium. Linseed meal has been effective against selenium poisoning in both rats and dogs. Fish meal, meat meal, and tankage appear to increase the toxicity of selenium.

Some effects of copper intake on cattle, W. M. NEAL. (Fla. Expt. Sta.). (*Amer. Chem. Soc. Mtg.*, 103 (1942), *Abs. Papers*, p. 7A).—Symptoms of copper deficiency in cattle have been found to include anemia, diarrhea, loss of appetite, and depigmentation of the hair. Not all affected animals are anemic. Less than 1.5 to 3.0 p. p. m. of copper in forage dry matter will cause deficiency, although deficiency may occur with several times this amount.

Blackleg in cattle, H. WELCH (*Montana Sta. Cir.* 167 (1942), pp. 6, figs. 3).—A revision of Circular 144 (E. S. R., 72, p. 693).

Abscesses due to infection with *Corynebacterium pyogenes* in bovines, J. G. H. HOEBEN (*Austral. Vet. Jour.*, 18 (1942), No. 5, pp. 209-211).

An attempt to demonstrate a virus as the cause of mastitis in cattle, L. D. BUSHNELL. (Kans. State Col.). (*Jour. Bact.*, 44 (1942), No. 3, p. 393).—The author has been unable to confirm the finding of Broadhurst, Cameron, and McLean (E. S. R., 82, p. 103) regarding a filtrable virus as the cause of mastitis in cows.

Some new observations on the developmental cycle of the organism of bovine pleuropneumonia and related microbes, E. KLIENEBERGER and J. SMILES (*Jour. Hyg. [London]*, 42 (1942), No. 2, pp. 110-123, pls. 4).—A study made of the growth phases of pleuropneumonia by two new methods, (1) a new fixing and staining technic and (2) a new dark-ground method, is reported upon. The life cycle of the organism of this affection and related microbes as revealed by means of both methods is described.

The geographical distribution of bovine trichomoniasis, B. B. MORGAN and B. A. BEACH. (Wis. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 11, pp. 459-462, figs. 3).

Persistent foramen ovale and multiple defects of interventricular septum in a calf, J. W. BRITTON. (Univ. Calif.). (*Cornell Vet.*, 32 (1942), No. 3, pp. 339-341, fig. 1).

Haemoglobinuria of calves in the south-west of Western Australia, L. W. MAHAFFEY, H. W. BENNETTS, and A. F. FLOOD (*Austral. Vet. Jour.*, 18 (1942), No. 5, pp. 205-208).—A disease of young calves in which hemoglobinuria is the principal clinical sign is described. Although the etiology is undetermined, the disease does not appear to be infectious or to be due to an enterotoxemia or to copper poisoning.

A "staggers" syndrome in sheep and cattle associated with grazing on *Phalaris tuberosa*, I. W. McDONALD (*Austral. Vet. Jour.*, 18 (1942), No. 5, pp. 182-189).—Account is given of the staggers syndrome in sheep and cattle produced by feeding on a restricted diet of the young growth of the perennial grass *P. tuberosa*, which has been widely used in Australia for the development of permanent pastures and has proved very valuable. The rarity of the affection contrasted with the common use of the plant is noted, but no explanation of the phenomenon is available. The disease is closely analogous to that produced by perennial ryegrass (*Lolium perenne*) and is similar in many respects to staggers due to the ingestion of several other plant species. At autopsy no pathognomonic lesions were observed. The chief abnormality noted in microscopic examinations was a degeneration of certain tracts in the spinal cord. Hemosiderosis of the kidney was a concomitant feature.

A preliminary note on the aetiology of enzootic jaundice, toxæmic jaundice, or "yellows," of sheep in Australia, H. E. ALBISTON, L. B. BULL, A. T. DICK, and J. C. KEAST (*Austral. Vet. Jour.*, 16 (1940), No. 6, pp. 233-243, figs. 2).—The Toxæmic Jaundice Investigation Committee has been led to conclude that toxic jaundice, which occurs mainly in enzootic form almost exclusively in British breeds of sheep or their crosses in Australia, is due to a disturbance of copper metabolism associated with high storage values for copper in the liver and a sudden mobilization of copper into the blood stream. The high storage value is possibly associated with the ingestion of food with a higher content of copper than may be found in pasture plants in the nonenzootic areas. There may be also a low efficiency in the excretion of copper, but evidence of this does not exist. Although the disease is essentially the same as copper poisoning, it is not due to excessive intake of copper through licks, drenches, or through contamination of pasture or of the water with copper.

Investigations on contagious ophthalmia of sheep, with special attention to the epidemiology of infection by *Rickettsiae conjunctivæ*, W. I. B. BEVERIDGE (*Austral. Vet. Jour.*, 18 (1942), No. 4, pp. 155-164, fig. 1).

Saving Oregon's ewes and lambs: Pregnancy disease of ewes, O. H. MUTH, J. N. SHAW, and D. E. RICHARDS (*Oregon Sta. Cir. Inform.* 277 (1942), pp. 8).—A practical account of this nutritional disease of ewes, which results from insufficient intake of feed during the last 6 weeks of pregnancy. The nutritional requirements for its prevention are discussed. While treatment should not be depended upon for its control, the lives of some affected ewes can be saved if it is started when the first symptoms appear. It consists in the administration of 0.5 lb. of commercial sugar, corn sirup, or molasses dissolved in 1 gal. of warm water by means of a stomach tube and repeated daily until the ewe again feeds normally.

Nodular worm disease of sheep, M. P. SABLES and A. O. FOSTER (*U. S. Dept. Agr. Leaflet* 228 (1942), pp. [2]+6, figs. 4).—A practical account of nodular worm affection of sheep with directions for its control and eradication. This parasite, known as the nodular worm because it causes abscesslike swellings or nodules in the wall of the intestines and produces the condition called nodular disease, pimply gut, or knotty gut, is responsible for serious losses to the meat industry and to the sheep raiser. The formation of nodules and gritty masses in the intestinal

wall causes direct loss by rendering the intestines unfit for sausage casings or for the manufacture of surgical sutures. It is pointed out that such losses are doubly serious because of the greatly increased demand for all these products and difficulties in obtaining them from other sheep-raising countries. The practical prevention of this disease can be achieved in great measure by timely treatment with phenothiazine in conjunction with pasture hygiene and general sanitation.

Enzootic ataxia of lambs in South Australia, I. W. McDONALD (*Austral. Vet. Jour.*, 18 (1942), No. 4, pp. 165-172).

The incidence, prevalence, and distribution of the helminths infesting the lungs and alimentary tract of the pig in Queensland, F. H. S. ROBERTS (*Austral. Vet. Jour.*, 16 (1940), No. 6, pp. 259-266).—Twenty species of helminths representing 17 genera are listed as parasites of pigs in Queensland. Of a total of 243 pigs examined, 185 were infested, yielding 14 different species of helminths. The incidence and prevalence of each of these were determined.

Further Salmonella infections in pigs and acute paratyphoid septicaemia in horses, D. F. STEWART (*Austral. Vet. Jour.*, 16 (1940), No. 6, pp. 266-267).

Sulfaguanidine chemotherapy in enteric conditions of swine (*North Amer. Vet.*, 23 (1942), No. 10, pp. 653, 670).

The anomaly of a normal Duke's and a very prolonged saline bleeding time in swine suffering from an inherited bleeding disease, E. T. MERIZ. (Mo. Expt. Sta.). (*Amer. Jour. Physiol.*, 136 (1942), No. 3, pp. 360-362, fig. 1).—The saline bleeding time in swine suffering from an inherited bleeding disease was found to be about six times the normal value. In contrast, Duke's bleeding time is consistently normal.

Grass sickness in horses: A review of the present knowledge of the disease, with particular reference to the nature of the causal agent, J. R. GREIG (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 54 (1942), pp. 1-27).

Estudios de inmunidad cruzada entre el virus de la encefalomiелitis equina de Venezuela y los virus encefalomiелiticos norteamericanos este y oeste y el Argentino (Cross-immunity studies between Venezuelan equine encephalomyelitis virus and eastern, western, and Argentine virus, V. KUBES and A. DIAMANTE (*Bol. Inst. Invest. Vet. [Venezuela]*, 1 (1942), No. 2, pp. [1]+49-79; *Eng. abs.*, pp. 77-79; *Eng. abs. also in Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 12, pp. 357-359).—The studies here reported have led to the conclusion that the virus of Venezuelan equine encephalomyelitis is a sui generis immunological entity bearing no specific antigenic relationship to eastern, western, or Argentine virus.

Studies with equine streptococci, II-IV, P. L. BAZELEY (*Austral. Vet. Jour.*, 16 (1940), No. 6, pp. 243-259, figs. 2; 18 (1942), Nos. 4, pp. 141-155; 5, pp. 189-194).—These studies are in continuation of that noted (*E. S. R.*, 84, p. 249).

II. *Experimental immunity to Str[eptococcus] equi* (pp. 243-259).—In a search of the literature little evidence was found that vaccines made from *S. equi*, the causative agent of strangles in horses, possessed immunizing powers when tested in small laboratory animals. When mice were used by the author as test animals young culture vaccines of *S. equi* were shown to possess immunizing powers greatly superior to the older culture products, although the latter were not entirely lacking in this respect. Useful immunizing vaccines were found to consist mainly of capsulated organisms, indicating that the immunoantigen is associated with the capsular structure of *S. equi*. These vaccines appeared also to possess a strong repulsive surface charge on most organisms which was responsible for a slow rate of sedimentation. Poor immunizing vaccines were found to sediment rapidly. The exposure to heat at 56° C. necessary to kill vaccines of *S. equi* proved to be as small as 0.9 min. when a special apparatus was used. The advantage from

such short exposures seems to be negligible compared with a simple glass flask or test-tube technic. Some extra exposure above minimal lethal heat is also possible without severe damage to the immunountigen.

III. *Vaccination against strangles* (pp. 141-155).—In continuation of this work, certain vaccines previously in use against strangles were found to lack immunizing power. In the first of two field trials conducted with a view to determining the possibility of developing a vaccine to protect horses against strangles the results, while inconclusive, were in favor of a cautiously killed young culture vaccine. When such a vaccine was tested in larger groups of horses, definite immunizing powers were revealed which had a strong influence on the course of strangles epidemics in the regiments concerned.

IV. *Cross-immunity to Streptococcus equi* (pp. 189-194).—In tests of 32 strains of *S. equi* both for virulence in unprotected mice and in mice protected by serum prepared with a single strain definite cross-protection was shown by the univalent serum in all cases. There is considered to be strong evidence that only one immunological type of *S. equi* exists, at least in Australia. The importance of this finding in the vaccination of horses is emphasized.

Effects of phenothiazine on horses.—I, *Studies in haematology and pharmacology*, W. E. SWALES, H. B. COLLIER, and D. ALLEN (*Canad. Jour. Res.*, 20 (1942), No. 11, Sect. D, pp. 349-361, figs. 2).—In studies made on the anemia and cythemolytic icterus produced by 60- and 70- gm. doses of phenothiazine to horses weighing approximately 1,200 lb. it was shown that the continued and prolonged hemolytic effect of a single dose may be serious in a horse having a large proportion of microcytic erythrocytes. No evidence of damage to the liver was obtained, but clinical observations confirm a previous report that severe injury to the urinary system may result from a dose of 60 gm. of phenothiazine to a 1,200-lb. horse. A dose of 30 gm. removed all the strongyloid nematodes and did not cause hemolysis. Less than half the dose could be recovered from the excreta of treated animals. The effects of phenothiazine on horses are similar to those of sulfanllamide and sulfapyridine in susceptible humans. The possibility of overstimulation of the spleen with the consequent hyperactivity causing prolonged hemolysis is mentioned.

Incidence of leptospirosis among dogs in Honolulu as determined by serological agglutination tests, J. E. ALICATA and V. BREAKS (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 10, pp. 305-308).—Report is made of microscopic agglutination tests of the serums of 100 dogs from Honolulu in which fresh formalin-killed *Leptospira canicola* and *L. icterohaemorrhagiae* were used as antigens. Of these, 20 percent of the serums gave stronger agglutination reactions to *L. icterohaemorrhagiae* than to *L. canicola*, and 19 percent reacted more strongly to *L. canicola*. Leptospirae were recovered from 2 dogs suspected of having died of canicola fever. Of 500 rats examined in Honolulu, 2.6 percent were found to harbor leptospirae. This low incidence indicates little epizootiological relationship between murine and canine infections.

Distemper studies in ferrets.—VI, *Attempted control of a distemper epidemic in a ferret colony with tissue vaccines and with anti-serum*, E. A. WATSON, L. M. HEATH, and P. J. G. PLUMMER (*Canad. Jour. Compar. Med. and Vet. Sci.*, 6 (1942), No. 11, pp. 324-331).—In continuing this series (E. S. R., 88, p. 247), both tissue vaccines and antiserum protected ferrets to some extent against the natural spread of distemper provided these agents were employed individually within specific time limits after the appearance of the disease in the colony. The simultaneous use of tissue vaccine and antiserum, however, gave less protection than either of the agents applied separately at the same time periods after the beginning of the outbreak. The mortality in untreated ferrets

reached its peak between the ninth and twenty-fourth day, while that in the treated animal indicated no marked peak and was spread from the ninth to the fortieth day following treatment. Inclusion bodies as a criterion of infection could not be relied upon, since in random sampling among affected ferrets, seven of which were treated and seven untreated, these manifestations were present in only 42.8 and 14.2 percent, respectively, of the animals examined.

Soil temperatures and soil moisture as factors governing the seasonal incidence of certain parasitic worms, R. O. CHRISTENSON and H. H. CREEL. (Ala. Polytech. Inst.). (*Jour. Tenn. Acad. Sci.*, 17 (1942), No. 4, p. 341).—An abstract of a contribution presented at the annual meeting of the Association of Southeastern Biologists in April 1942. Autopsies of 165 chickens during the 12 mo. of 1941 revealed 15,969 intestinal parasites, largely *Heterakis gallinae* and *Ascaridia galli*. There was a considerable variation in the temperature and moisture characteristics of the various soil types, but only for short periods in May and June did the soil moisture attain sufficiently low levels to appreciably affect the survival of parasite eggs.

A survey of the incidence, distribution, and prevalence of the helminth parasites of the domestic fowl in Queensland, M. BROADBENT (*Austral. Vet. Jour.*, 18 (1942), No. 5, pp. 200-204).—The incidence and prevalence of 12 helminths of the domestic fowl found in nine districts in Queensland are reported upon.

Coccidiosis of poultry, C. D. LEE. (Iowa State Col.). (*North Amer. Vet.*, 23 (1942), No. 7, pp. 458-460).

Influence of sulfaguanidine on acquired resistance in chickens to cecal coccidiosis, R. W. ALLEN and M. M. FARR. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 464-465).—The authors' findings from feeding experiments involving 267 11-day-old Rhode Island Red chickens indicate that a 0.5-percent concentration of sulfaguanidine in the mash is sufficiently high to be of value as a prophylactic for cecal coccidiosis yet not so high as to interfere with the acquirement of an effective resistance to the disease.

Sage grouse coccidiosis not transmissible to chickens, R. F. HONESS. (Wyo. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 6, p. 560).—An outbreak of coccidiosis among the sage grouse (*Centrocercus urophasianus*) in Fremont County, Wyo., led to cross-infection experiments. Not a single case of coccidiosis developed in either the experimental domestic chickens or in the control chickens during the 3 yr. under way. Two groups of experimental chickens were later fed viable oocysts from mixed infections in the domestic chicken, all of which developed severe coccidiosis and many succumbed. The author was led to conclude that coccidiosis is not carried to domestic chickens by the sage grouse, and that the infection in the sage grouse is not brought about by contact with infected domestic birds.

Effect of quinine upon the course of fowl-pox infection in the chick, B. H. ROBBINS (*Jour. Pharmacol. and Expt. Ther.*, 76 (1942), No. 1, pp. 57-63, figs. 2).—Report is made of the effect of quinine in altering the normal course of development of experimental fowl pox infection in the chick.

Experiments with X-rays on the roles of lymphocytes and body temperatures in the resistance of chicks to *Salmonella pullorum*, J. C. SCHOLTES. (Cornell Univ.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 561-565, fig. 1).—Report is made of an experiment conducted to determine the effect of exposure of 6-day-old chicks to 360γ units of X-ray. The body temperatures of exposed chicks brooded at 28° C. were significantly lower than those of control chicks on the second, third, and fourth days following exposure. The body temperatures of chicks brooded at 35° were only slightly affected. There were indications of injury to intes-

tinal mucosa and to the liver. It is suggested that tissue injury may have been responsible for the lowered resistance of chicks to *S. pullorum* following X-ray treatment observed by Roberts, Severens, and Card (E. S. R., 82, p. 466). The relation between body temperature and resistance to *S. pullorum* is discussed, and it is concluded that resistance more likely depends upon temperature differences than upon differences in the number of lymphocytes in the blood.

Sanitation important in controlling paratyphoid infection of turkeys (*North Carolina Sta. Rpt. 1941, pp. 58-59*).—Reference is made to the progress of work which has emphasized the importance of sanitation in the handling of breeder turkeys and suggests a method for the eradication of paratyphoid disease through the detection of breeder carriers. That it is possible to control the disease in its worst phase by incubator fumigation is indicated, since the infection is found on the eggshells. It is deemed essentially an intestinal rather than a blood disease, and studies on 80 artificially infected poults, as well as survivors of diseased poults, indicated that infected poults do not become chronic carriers.

Clinical pathology of trichomoniasis of the lower digestive tract of turkeys, E. A. ALLEN and M. W. OLSEN. (U. S. D. A.). (*Poultry Sci.*, 21 (1942), No. 5, p. 464).

Trichomoniasis of the upper digestive tract of domesticated birds, L. D. BUSHNELL. (Kans. State Col.). (*Poultry Sci.*, 21 (1942), No. 5, pp. 466-467).

AGRICULTURAL ENGINEERING

The principles of field drainage, H. H. NICHOLSON (*Cambridge, Eng.: Univ. Press; New York: Macmillan Co., 1942, pp. XI+165, pls. 12, figs. 29*).—The author disclaims any attempt to deal with the technicalities of surveying, engineering, or even the drainer's art. His aim has been, rather, to draw attention to the fundamentals of the subject, to present "a philosophy of draining," and to deal with the factors involved and the way in which they influence events in the soil.

The contents include chapters on former neglect of drainage work, measures of government assistance; the history of field-draining developments in Great Britain; the moisture properties of soil, the incidence of drainage; percolation, permeability, the water table, the special case of clay land; drainage conditions in the field (soil and site factors, the main types of drainage circumstances); the use of published maps in field-drainage work; the investigation of field-drainage problems; ditches; tile draining, methods and principles, renovation of old systems, design and materials; mole draining, suitable soils, details, causes of failure, machinery, procedure; the way in which drains work, rates of flow from outfalls; drainage of airdromes, sports grounds and field fortifications; field drainage, river flow and floods; and field drainage, present position and progress.

Stratified flow in reservoirs and its use in prevention of silting, H. S. BELL (U. S. Dept. Agr., Misc. Pub. 491 (1942), pp. II+46, figs. 40).—Stratified flows or density currents are described, and their behavior in natural and artificial lakes is discussed. Some striking photographs of laboratory demonstrations of such under- and interstreams are reproduced. Uses of such flows for the removal of suspended material from reservoirs before it settles out and for the similar removal of underlying layers of salty water are suggested.

Removal of fluorides from public water supplies, R. C. GOODWIN and J. B. LITTON (*Indus. and Engin. Chem.*, 33 (1941), No. 8, pp. 1046-1048, figs. 3).—Pilot plant experiments on the use of a mixture of calcium phosphate monohydrate any hydroxy apatite are reported. Water containing approximately 5 p. p. m. of fluorine was reduced to an average fluorine content of 0.42 p. p. m. The

purifying material can be regenerated by treatment with sodium hydroxide, washing, and neutralizing with carbon dioxide.

How to increase farm production with reduced man power, D. A. MILLIGAN (*Agr. Engin.*, 23 (1942), No. 10, pp. 309-311, figs. 2).—The author lists as means for increasing farm production with reduced man power: Reduction of man labor per crop unit; reduction of number of operations performed in the producing of crops; working more hours per day and more days per week, per month, and per year; a well-organized and diversified system of crop and livestock production with a distributed labor requirement; and increasing the yield maxima. Under the first two headings, operating the tractor with its largest practicable load, especially for the purpose of combining two operations into one, is one of the principal suggestions offered, but poor preparation of seedbed to effect a saving of labor is specifically condemned. In connection with the increase of number of working hours per man, the elimination of tiring mechanical noise, discomfort due to unnecessary jar, heat exposure, and exhaust fume inhalation is emphasized, together with some device facilitating the work itself. Concerning the fourth point, it is noted that livestock production is ideally adapted to the distribution and leveling of labor requirements, that diversified crops and production reduce the hazard of crop failures, and that the proper diversification of crops and livestock may eliminate harvesting altogether. With reference to the raising of the yield maxima, it is urged that farmers avoid attempting acreage greater than they can handle with power and equipment sufficient to prepare the seedbed at the proper time, and that in adverse seasons it is better to leave certain of the land idle than to prepare, seed, plant, and tend poorly a larger acreage which, under those conditions, may result in crop failure or low yields and poor quality.

The integration of farm equipment into the war effort, F. J. ZINK (*Agr. Engin.*, 23 (1942), No. 10, pp. 317-320, figs. 3).—This is a general discussion presenting, with numerical data, various questions raised by the required increase in production of food, fiber, and oil crops as problems of the agricultural engineer. The need for avoiding the errors of the former war, as that of bad land use and other mistakes leading to economic upset, is emphasized. Other points demanding the attention of the engineer are the questions whether or not increased numbers of workers drawn from the farm population and from other sources can meet the need without increased supplies of labor-saving equipment, to what extent joint use of mechanical equipment can be practiced before the vanishing point of increasing capacity is reached, to what extent custom operation of machines will be a practicable solution of machine shortages, how much machine power can be replaced by animal power, etc.

Changes in hay handling methods and equipment, A. E. W. JOHNSON (*Agr. Engin.*, 23 (1942), No. 10, pp. 325, 327, fig. 1).—The author briefly outlines mechanical equipment development since 1918, indicating that diversity of land type and of acreages will continue to require a wide variety of equipment. The introduction of new pasture grasses, some of which will be cut for hay, may bring new harvesting problems. Of the new hay harvesting machines, the recent development of the forage harvester seems to offer considerable promise. Although some hay will be necessary when grass silage is fed, the forage harvester can be used for this type of haying. A mower, side-delivery rake, and forage harvester equipped with pick-up attachment can be used conveniently and economically. The same wagons and blower as used for green crops provide the means for hauling and elevating the chopped hay into the barn. Recent efforts in the development of lighter and more economically operated pick-up balers, likewise, are

extremely promising and will probably be increasingly attractive to many individual users.

Once-over cotton planter and fertilizer distributor developed for the cotton farmer. (Coop. U. S. D. A.). (*North Carolina Sta. Rpt. 1941, pp. 21-22, fig. 1*).—A brief account of this combination planter and distributor.

Developments in fruit dehydrator design, R. GUILLOU. (Univ. Calif.). (*Agr. Engin., 23 (1942), No. 10, pp. 313-316, figs. 9*).—The author points out that dehydrator design thus far has had to depend upon assumptions, based upon accepted practice, with reference both to tunnel dimensions and to drying time, and that "so long as performance of a design is based on an assumed drying time, there can be no intelligent determination of the effect of air velocity, temperature, or other factors on capacity of the unit." He briefly describes measurements of drying rates of prunes carried on for the past two seasons in a small wind tunnel provided with means for controlling and measuring the temperature, velocity, and humidity of the air to obtain quantitative relations among dehydrator conditions, drying rates, and quality of product. The drying section holds 400 prunes, of which 100 are a source of samples to be used as a check on moisture content. The remaining 300 are weighed hourly to determine drying rate and furnish samples for final determination of moisture content and appraisal of quality. By analyses of these data he deduces empirical expressions for drying rate in terms of the variables involved and separately develops the optimum value for each of controllable variables. The results are embodied in a design believed to provide the closest practicable approach to the optimum values. The author holds that a similar method could be applied for the designing of equipment for any other similarly dehydrated product.

Remodeled barns help meet wartime needs, J. M. ANDERSON (*Agr. Engin., 23 (1942), No. 10, pp. 326-327, figs. 2*).—The author finds inadequate or improperly designed footings to be one of the common causes of deterioration, the footings being often not deep enough to prevent frost heaving or having a spread insufficient to provide against settling, with the result that the building is subject to leaning, sagging, or bulging. The remedy here discussed consists in putting in new concrete footings and foundation walls and replacing the side walls up to the mow floor with a hollow tile. The author finds that the most common rebuilding procedure is to jack up one-half of the barn at a time. By jackscrews one-half of the building can be easily raised to a height giving sufficient clearance for a mason to complete the new wall.

Dairy barn construction (*Vermont Sta. Bul. 495 (1942), p. 24*).—Dairy barn construction work by H. B. Ellenberger included analysis of temperature data for measuring the thermal efficiency of sundry insulating materials located within the side walls and ceiling of a one-story dairy barn, making hygrothermograph records which show a rather uniform temperature throughout the winter in a one-story dairy barn ventilated with exhaust fans but widely fluctuating in percentage of relative humidity, moisture gage readings on the wooden sheathing of the side walls and ceiling, etc.

Store food for the winter (*West Virginia Sta. Cir. WS 6 (1942), pp. [8], figs. 2*).—Improvised storage arrangements suitable, respectively, for fresh fruits and vegetables, for dried fruits and vegetables, and for canned foods are briefly discussed. Heat treatment designed to prevent insect damage to dried material which is to be held in closed containers is described, and the need for both the heating and the exclusion of air is emphasized. The insulating value of various thicknesses of commonly available insulating materials is compared to that of 1-in. corkboard or of granulated cork. Ground storage, trenches, pits, and mounds are among the expedients considered.

Ventilation of ear corn in metal cribs, G. R. SHIER and R. C. MILLER (*Ohio Sta. Bimo. Bul.* 219 (1942), pp. 171-177, figs. 7).—The construction of simple horizontal ventilating flues with side walls of 2- by 4- or 2- by 6-in. lumber is described, together with conversion of the ordinary suction cowl ventilator by the reversal and enlargement of the directing vane. In tests carried out in 1940 and 1941, the horizontal flue systems tried were sufficiently effective to prevent mold almost entirely. The pressure cowl ventilators made by reversing the suction cowl type were also effective, but the suction cowl unaltered was not effective enough to prevent spoilage.

Methods of moisture drainage from silos, C. K. OTIS. (Minn. Expt. Sta.). (*Agr. Engin.*, 23 (1942), No. 10, pp. 321-323, figs. 8).—In order to determine (1) the amount and the rate of flow of juice to be expected under various conditions, (2) the manner in which the juice leaks from the silo, (3) the chemical composition of the juice drained off, and (4) a method of construction that will insure a minimum of leakage, a 14- by 45-ft. silo was especially constructed and equipped and compared with a silo of the same size already in use for alfalfa silage and equipped with a gravel bottom and a side wall drain to a height of 20 ft. on each side of the doors. The wall of the experimental silo was divided into four quadrants, two of which were plain walls similar to those of a conventional concrete stave silo and the other two equipped with sidewall drains. The wall drainage was collected from each quadrant separately by means of a trough, cast in the top of the foundation wall, which carried the juice to an outlet pipe and thus to a pail outside where the liquid was measured. The concrete floor was equipped with a drain trough, running across the diameter of the silo and covered with concrete plates fitted loosely to provide easy passage for the juice. Of the two types of sidewall drains used, one consisted of continuous grooves cast into the staves. These grooves were $\frac{1}{4}$ in. deep and $\frac{1}{4}$ in. wide, about 1 in. apart, and extended to the top of the silo. The drains used on the other wall consisted of perforated metal ducts inserted into grooves cast into the staves, placed 10 in. apart, and extend 25 ft. upward. Portholes 4.5 in. in diameter at 5-ft. intervals were used for taking horizontal samples for density determinations and smaller portholes for temperature measurements and observations. Drainage data, juice analysis figures, and estimates of the loss of nutrients in the drained-off juice are tabulated, and variations of the density of the silage mass with depth and distance from the side walls are graphically shown. With reference to the cause and prevention of leakage, the density of the mass was found to increase with depth to a degree causing the descending juice to build up a head, whereas the density decreased from center to side wall, allowing the juice a relatively easy lateral flow. The principle of sidewall drainage was therefore concluded to be sound.

A wood-burning conversion unit for household furnaces, H. W. HICOCK, A. R. OLSON, and L. E. SEELEY (*Connecticut [New Haven] Sta. Bul.* 463 (1942), pp. 593-614, figs. 5).—The inefficient burning of wood in the average household furnace because of the limited capacity of the firebox and failure to provide sufficient room for the gases to burn out, with resulting high chimney losses and fouling of heating surfaces and flues with tar, has been overcome by a conversion unit of radically improved design. This unit provides, essentially, a fuel chamber, a combustion tunnel, a built-in air duct system, and a draft slide to control the air supply. With the exception of the cast-iron feed door and frame, construction is entirely of noncritical materials. These materials comprise firebrick, a few soft, high-temperature insulating bricks, wood parts for the draft slide, concrete parts to be cast in place, etc. The successive steps in the construction are fully described and are clearly illustrated in diagrams, detailed

drawings, sections, and an isometric drawing of the completed unit with parts cut away to show the interior. Directions for securing convenient operation and efficient performance are included.

Tests of the new device showed that it will operate satisfactorily either at low or at high combustion rates. Either seasoned or freshly cut wood was satisfactorily used. At low rates, when air is admitted through one duct only, the unit functions like a charcoal kiln, the wood being slowly reduced to charcoal with a shrinkage of from 30 to 50 percent in volume. By continued use of one duct only the charcoal will also be consumed. Combustion of charcoal under these conditions will be very slow and refueling will probably not be needed oftener than every 24-30 hr. At high rates two main ducts, as well as a secondary air duct, are fully open and air enters the fuel chamber at four points. Rapid combustion takes place, and after several hours a glow is visible near the combustion tunnel and over the air inlets into the fuel chamber. Charcoal is apparently burned as fast as it is formed and, when the fuel mass is almost consumed, will be found only along the chamber side walls. A full charge of wood (about 0.1 cord) will last for only from 6 to 8 hr. under these conditions. This rate of fuel consumption will be necessary only in the most severe weather.

AGRICULTURAL ECONOMICS

[**Proceedings of the fifteenth annual meeting of the Western Farm Economics Association**] (*West. Farm Econ. Assoc. Proc.*, 15 (1942), pp. 170, figs. 4).—At this meeting, held at Palo Alto, Calif., June 24-26, 1942, the principal papers, with discussions, were as follows: Presidential Address, by R. R. Renne (pp. 11-12) (Mont. State Col.); Current and Prospective Problems of Western Agriculture Accompanying the War, by H. R. Wellman (pp. 13-21); Western Agriculture in the Last War, by E. F. Dummeyer (pp. 22-29) (Wash. State Col.); Symposium on Western Agriculture in the Post-War World, by J. S. Davis (pp. 33-34); Problems and Policies Facing the Range Livestock Industry, by A. F. Vass (pp. 35-39) (Univ. Wyo.); Western Agriculture After the War, With Special Reference to Fresh, Canned, and Dried Fruits, by F. R. Wilcox (pp. 40-42); The Use of Uncultivated Lands in Western United States, by S. N. Wyckoff (pp. 43-45) (U. S. D. A.); Adjustment of Western Agriculture to the Unfolding Economic Objectives of the War, by H. M. Creech (pp. 46-48); The Effect of Post War Reclamation Expansion on the Agriculture of the West, by C. H. West (pp. 49-50) (U. S. D. A.); Trends in Agricultural Cooperation, by E. A. Stokdyk (pp. 51-62); Agricultural Output Control in War Time, by S. Enke (pp. 63-72) (Mont. State Col.); Agricultural Price Policies in War Time, by H. Working (pp. 73-85); Is Federal Crop Insurance Worth Its Cost? by J. C. Clendenin (pp. 95-104) (Univ. Calif.); Public Control of the Marketing of Fluid Milk in California, by W. J. Kuhrt (pp. 105-110); Merchandise Availability on Typical Rural Towns, by D. E. Faville (pp. 111-115); Farm Management Problems Associated With Attainment of Production Goals, by N. O. Thompson (pp. 118-124) (Univ. Ariz.); What Should Be Done About Farm Tenancy (The Problem at the National Level), by J. Ackerman (pp. 127-131); Economic Planning in a Democratic Society, by D. F. Pegrum (pp. 134-145), and Problems in Planning Wartime Agriculture, by J. M. Tinley (pp. 146-152) (both Univ. Calif.).

[**Investigations in agricultural economics at the Mississippi Station**] (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, pp. 1, 2, 3-6, 7, 8, figs. 6).—A short article, Profitable Year for Truck Crops in Copiah County, by M. Guin (p. 2), gives data as to average receipts, expenses, investment, prices received, labor income, etc., for 80 truck farms in 1941. Another short article, by F. J. Welch

(p. 8) (coop. U. S. D. A. et al.), discusses the studies on farm labor needs, production goals, land tenure in the Yazoo-Mississippi Delta, farm adjustments, and the Copiah truck area, and also the social effects of government purchase of land in Lafayette County affected by the construction of the Sardis Dam and Reservoir. A third article, Beef Calf Production in Mississippi, by R. H. Means, A. E. Cullison, E. B. Ferris, and S. P. Crockett (pp. 1, 3-6, 7), discusses beef production under conditions of minimum-for-efficiency investments in pasture and breeding herds. It is based on the findings of studies at the central station at State College, the Holly Springs and Natchez Substations, and the Oktibbeha-Winston land-use research area in the east central part of the State.

[Investigations in agricultural economics by the North Carolina Station] (*North Carolina Sta. Rpt. 1941*, pp. 67-68).—Brief findings are included as to the rate at which delinquent farm taxes are paid, the improvement of low incomes on cotton farms (coop. U. S. D. A.), costs of ginning cotton, and costs of operating tobacco warehouses.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 219* (1942), pp. 178-180).—An article, Sources of Revenue of Ohio Governments, by J. D. Thewlis (pp. 178-179), includes and briefly discusses a table showing by selected years, 1917-40, the total revenue receipts for State and local governments and the percentage distribution by source. The table of index numbers of production, prices, and income, by J. I. Falconer (p. 180) (E. S. R., 88, p. 394), is brought down through August 1941.

Area analysis and agricultural adjustments for Chase County, Kansas, W. H. PINE, M. L. OTTO, and W. H. MERZGER (*Kansas Sta., Agr. Econ. Rpt. 14* (1942), pp. [1]+13, fig. 1).—A study similar to that for Nemaha County, previously noted (E. S. R., 88, p. 397).

Farm plans for upland farms in the Bluestem Belt of Kansas, W. H. PINE (*Kansas Sta., Agr. Econ. Rpt. 15* (1942), pp. [1]+7).—Budgets prepared for seven types of organization for 320-acre upland farms in Chase County are compared.

Trends in land use and related changes in Knott County, Kentucky, 1929-1939, R. H. ALLEN and C. G. DEATON. (Coop. U. S. D. A.). (*Kentucky Sta. Bul. 428* (1942), pp. 39, figs. 4) —A field survey was made in the summer of 1940 to obtain land use and related data for a representative sample of farms comparable to those for which similar data were obtained in 1929 (E. S. R., 78, p. 433). Usable records were obtained from 316 farms, of which 127 were covered by the 1929 study. The records were analyzed to show the size of farms, tenure, land use, crop and livestock production, cash farm receipts and expenditures, outside income, family income, etc., and the changes from 1929 are discussed. The population changes and migration and the educational facilities of the county are described.

During the decade the population of the county increased 28 percent and the number of farms 36 percent, but the total land in farms decreased 5 percent. The proportions of cropped land and plowable pasture increased. Corn acreage per farm and total crop acreage in corn decreased. The numbers of workstock and the receipts from sales of farm products declined sharply. Cash incomes were derived mostly from nonfarm sources.

The farm real estate situation, 1939-40, 1940-41, and 1941-42, M. M. REGAN and A. R. JOHNSON (*U. S. Dept. Agr. Cir. 662* (1942), pp. 45, figs. 8).—This is a continuation of the series previously noted (E. S. R., 83, p. 118). Substantial increases in land values and a strengthening of the farm real estate market characterized the farm real estate situation during the year 1941-42.

Experience after the last war clearly demonstrated the desirability of avoiding excessive increases in values during this war.

Recent changes in tax rates on farm real estate in North Carolina, G. W. FORSTER (*North Carolina Sta. Tech. Bul.* 72 (1942), pp. 28, figs. 7).—"The purpose of this study is to reveal the major causes of and the more important social and economic implications involved in changes in tax rates, and to suggest methods by which tax rates may be adjusted to the income of the taxpayer. These methods are designed to provide a uniform flow of revenue for the support of public institutions and services." The study covers the period from 1913 to 1940, with special attention to the periods 1920-40 and 1930-40. From 10 to 20 farms in each county representative of various types of farming, economic and social conditions, and physical factors were chosen for study, and data were secured from county records as to acreages, assessed value, property taxes levied, and tax rates. The State tax relief to property holders, changes in tax rates, causes for changes in rates, and the behavior of public expenditures are discussed. Tables and charts are included and discussed showing by years, 1920-40, the index of farm income by areas of the State, the movement of farm cash income and taxes per acre, average tax rates per acre, and index numbers in 8 South Atlantic States, farm real estate taxes per acre (1913, 1928, and 1940) in the 48 States, the relation of tax rates and farm income in typical counties of North Carolina, and the receipts and expenditures 1919-37 for schools in the State. Two methods—the budgetary method and the borrowing and repayment method—for the prevention of recurrence of past conditions as to taxes and expenditures are suggested, and the advantages of the methods and the difficulties in the way of their adoption are discussed.

Farm taxation in Nevada, F. B. HEADLEY and M. L. CONNOR. (Coop. U. S. D. A.). (*Farm Mangt. Bul. [Nev. Sta.]*, 3 (1942), No. 2, pp. [1]+14, figs. 7).—This is a brief discussion of land ownership, assessed valuations, owners' valuations, tax rates, etc. It is based on reports of State and county officers and the Nevada Taxpayers' Association and a study covering 51 farms in Churchill, Clark, Douglas, and Lyon Counties.

Labor and power needs on crops in Bulloch County, Georgia, W. E. HENDRIX and W. T. FULLILOVE. (Coop. U. S. D. A.). (*Georgia Sta. Cir.* 139 (1942), pp. 16, figs. 2).—The data were obtained in 1941 by the survey method from 172 farmers selected at random and are based on the usual production practices and normal crop yields in the county. Tables are included and discussed showing the usual number of man-, mule-, and tractor-hours used per acre of specified crops by production operations with different levels of equipment, and the usual amounts and distribution by half-month periods of the man-, mule-, and tractor-hours with one-mule and two-mule equipment and one-row and two-row tractors. The charts show the periods in which production operations are usually performed on different crops and the distribution by half-month periods of man-hours used on specified crops with two-mule equipment. The possibilities of fuller utilization of farm labor by increasing acreages and adding new crops are illustrated.

A survey of newer haymaking methods on western Nevada farms, D. EVANS. (Coop. U. S. D. A.). (*Farm Mangt. Bul. [Nev. Sta.]*, 3 (1942), No. 5, pp. [1]+9).—A field survey was made of farms in Douglas, Lyon, and Churchill Counties, using pick-up balers, pick-up choppers, or other labor-saving methods of haymaking. Tables show the tons handled per hour, man-hours per ton, and similar data for balers, choppers, loaders, buck rakes, etc. Because of the smallness of the sample, most of the data are for individual farms rather than averages.

Dairy opportunity areas in New Hampshire, H. C. WOODWORTH and J. C. HOLMES (*New Hampshire Sta. Bul.* 340 (1942), pp. 29, figs. 11).—"Data concerning the size and location of every dairy enterprise were obtained from town inventories and from the selectmen. Brief conferences on the productivity of fields and pastures, on the type of farms, the topography, the ease and difficulties of cultivation, the market outlets, and on the trend in dairying were held with individuals in each town." The land areas were differentiated as to dairy opportunities as favorable, marginal, unfavorable, and nonagricultural. Tables show for the State the distribution of farms and of cows by size of herds, distribution of herds and cows by dairy opportunity areas by counties, and the distribution of herds and cows by types of farms (commercial and noncommercial) and by dairy areas. A map shows the different dairy opportunity areas. Tables and a map for each county show the distribution of farms and cows by size of milking herds and dairy opportunity areas.

Factors affecting dairy farm income, M. L. CONNOR. (Coop. U. S. D. A.). (*Farm Mngt. Bul.* [Nev. Sta.], 3 (1942), No. 3, pp. [1]+5).—During a 6-yr. period 114 dairy farm records were obtained. These are scored on the basis of the following efficiency factors as above or below the average: Number of cows, price received for butterfat, butterfat per cow, return over feed cost per cow, return per \$100 worth of feed, number of animal units, and total productive work units. The different factors are discussed. The average net farm income increased from \$379 per year for the eight farms with none of the factors above the average to \$5,713 for four farms with all factors above the average.

Economics of scale in the operation of country milk plants, with special reference to New England, R. G. BRESSLER, JR. (Coop. 6 expt. stas., U. S. D. A., et al.). (*Boston: New England Res. Council Market. and Food Supply*, 1942, pp. 92, fig. 17).—This is a study of the relation of decreases in unit operating costs to increases in the scale of operation, under the most efficient operating conditions.

Distribution of milk in Manhattan, Kansas, and methods of conserving tires, R. W. HOECKER (*Kansas Sta., Agr. Econ. Rpt.* 16 (1942), pp. [2]+14, fig. 1).—This report is based on data collected during the spring of 1942 from 17 of 20 milk distributors in the city and representing about 91 percent of the milk sold during the period. The retail and wholesale distribution are described and discussed. Possible alternate methods of distribution are also discussed.

"The greatest savings in tires and time could be obtained by the adoption of a unified wholesale delivery system. Substantial savings could be obtained, at considerably less inconvenience to the consumers, by the adoption of a unified alternate-day, house-to-house delivery system. Smaller but substantial savings can be made or already have been made by: Discontinuance of special deliveries; discontinuance of special trips to make collections; consolidation of routes, that is, discontinuing or exchanging customers that are at a distance from the main route; changing from early-morning to daylight delivery. The experience in Manhattan has demonstrated that if the public is sufficiently informed of the necessity of curtailing service, little opposition is offered."

Livestock movement at Kentucky auction markets, A. J. BROWN and C. D. PHILLIPS (*Kentucky Sta. Bul.* 432 (1942), pp. 32, figs. 8).—The volume of stock handled, total and per auction; size of auctions; receipts in different areas of the State; the proportion of receipts sold for slaughter; proportions of slaughter animals purchased by different types of buyers in different areas; the disposal of stocker, feeder, and breeding livestock in different areas; and the transportation of livestock to and from the auctions are described and discussed.

Forty-five livestock auctions were in operation in 1940. Total receipts at 43 auctions in 1939 were 1,802,609 head. Fifty-three percent of the cattle, 94 percent of the calves, 66 percent of the hogs, and 85 percent of the sheep and lambs were sold for slaughter. Order buyers and packer buyers purchased 65 percent of the cattle, 92 percent of the hogs, and 97 percent of the sheep and lambs sold for slaughter.

Facilities and services of Pennsylvania freezer-locker plants, W. R. WHITACRE (*Pennsylvania Sta. Bul.* 433 (1942), pp. [1]+13, figs. 3).—"The purpose of the study was to determine where locker plants were located and the services they offered patrons. It was also an aim of the study to learn who the locker patrons were, and how and to what extent they used the services offered by the plants. The importance of locker plants as a market outlet and the effect that the industry may have on the marketing of farm products were considered." The size and growth of the locker industry, the location, ownership, operation, facilities, services, rental rates, service charges, etc., are considered. The advantages and disadvantages of locker plants to the users and their use as market outlets for meats and vegetables are described.

The number of plants increased from 7 in 1938 to 40 in 1941. The operating plants reported 17,719 lockers, of which 81 percent were rented. The plants were generally in agricultural areas, and practically 74 percent of the patrons were farmers. Rental rates for lockers ranged from \$3 to \$17. Nine plant managers purchased 217,300 lb. of beef and 3,300 lb. of pork for resale. "Vegetables and fruits also were purchased by plant managers for urban patrons. Increasing numbers of farmers were freezing vegetables and fruits for sale."

Seasonal prices of spring lambs on Kentucky auction markets, C. D. I'PHILLIPS and R. W. RUDD (*Kentucky Sta. Bul.* 427 (1942), pp. 35, figs. 11).—Using data for five representative auction markets in central Kentucky for the years 1927-39, analysis is made of the seasonal patterns of prices and average weights; the percentage of lambs sold in different price groups; and the relations and effects of weights, drought, and income and general price level on the seasonal lamb prices.

The typical change in prices was a rise from the beginning of the marketing season (first week in April) to a peak in the seventh to ninth week, and then a decline during the remainder of the season, with some leveling off during the last 4 or 5 weeks. The average weight of lambs rose during the first 5 or 6 weeks of the season and then declined during the remainder of the season. In general, an increase in weight up to 80 lb. was accompanied by a rise in price per 100 lb. Above 80 lb., increase in weight was accompanied by a decline in the average selling price. The seasonal decline in average price was accelerated by the fact that as the season progressed the proportion of low-quality lambs increased.

Crops and Markets, [October 1942] (*U. S. Dept. Agr., Crops and Markets*, 19 (1942), No. 7, pp. 165-196).—The usual crop and market reports and tables on fertilizers, farm labor and wages, etc., are included.

Foreign Agriculture, [November 1942] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 6 (1942), No. 11, pp. [2]+365-386, figs. 11).—The following articles are included: *Agricultural Relations With Mexico*, by K. Wylie (pp. 365-373); *British County War Agricultural Committees*, by M. E. Long (pp. 374-378); *Poultry Improvement in Southeastern Europe*, by C. E. Whipple (pp. 379-383); and *Wartime Rationing in Eire* (pp. 384-385).

RURAL SOCIOLOGY

Rural sociology and rural social organization, D. SANDERSON (*New York: John Wiley & Sons; London: Chapman & Hall*, 1942, pp. XVII+806, figs. 127).—

This is a comprehensive study of rural society divided into four parts, dealing with the relation between rural sociology and rural social organization; environmental conditions; rural institutions, groups, and classes; and rural social organization in relation to the Great Society.

Social problems [studied by the North Carolina Station] (*North Carolina Sta. Rpt. 1941, pp. 68-71, figs. 2*).—It is shown that North Carolina leads nearby States in population growth. The population of 3,571,623 in 1940 was 12.7 percent greater than the 1930 population of the State. The number of Negro owners declined from 19,711 in 1930 to 18,245 in 1940, Negro sharecroppers from 34,805 in 1930 to 26,803 in 1940, and other Negro tenants from 22,334 to 15,191.

Fifty years of population growth in Washington: A study of the trends in numbers, composition, vital traits, and migration of Washington population, P. H. LANDIS (*Washington Sta. Bul. 419 (1942), pp. 47, figs. 21*).—The State of Washington, with a population of slightly more than 75,000 in 1880, increased in size to more than 1,736,000 in 1940. In 1940, the Washington population was 26 persons per square mile as compared with 44 per square mile for the Nation. In the decades of the thirties the urbanization rate slowed down, the urban population increasing by 37,430 and the rural by 135,365. Males predominated over females in numbers, although the sex ratio was approaching a balance. In age composition, the population is aging rapidly because of increasing longevity and a declining birth rate. From 1930 to 1940 the number of old people, 65 yr. of age and over, increased from 101,503 to 142,491, or from 6.5 percent of the total population to 8.2 percent, which represents an increase of 20.6 percent in one decade. By 1980, it is expected that the old people will constitute more than 15 percent of the total population, and number approximately 300,000. Considering the trend in age composition, the death rate should continue to rise, in which case, unless the birth rate also rises, it is only a matter of a short time until there would be no natural population increase in the State.

A striking characteristic of the Washington population is the large proportion living in cities of more than 100,000. Although the rural population has a considerably higher birth rate than the urban population, a considerable proportion of its children on reaching the economically productive and reproductive ages move to the cities, leaving the farm group deficient in the age group 20 to 44 yr. The women in the West Coast States have a more decided advantage over men in expectation of life than in the United States as a whole. The life expectancy of white women for 1930-39 was 66.1 yr., compared with the rate of 60.7 yr. for white males. It seems likely that the State will continue for some time to make a net gain from migration.

Backgrounds of the war farm labor problem (*U. S. Dept. Agr., 1942, pp. [I]+IV+183, figs. 2*).—The Bureau of Agricultural Economics and the Farm Security Administration have assembled the more important facts about the varied conditions of farm employment. Part 1 discusses the problems of farm labor and factors behind them, with recommendations for action. Part 2 is a description of the various classes of farm labor and the economic and social status of farm wage workers. Part 3 considers the farm labor market and legislative protection.

Wanted—man power for Arizona farms, seasonal and year-round farm labor requirements, Arizona, 1935-42, E. D. TETREAU (*Arizona Sta. Bul. 186 (1942), pp. [2]+36, figs. 2*).—The author shows that the problem of getting extra laborers for harvesting cotton and citrus fruits and tending truck crops in Arizona has become very serious. He indicates the amount of labor needed for Arizona farms as based on a study of conditions in Graham, Maricopa, Pima, Pinal, and Yuma Counties.

Rural youth in wartime Illinois, Randolph County, D. E. LINDSTROM, E. G. MOSBACHER, R. B. MCKENZIE, O. E. BAKER, N. T. FRAME, E. C. SECOR, ET AL.). (Coop. U. S. D. A. et al.). (*Illinois Sta.*, 1942, *RSM-10*, pp. [3]+9).—This mimeographed publication presents facts gathered by the Rural Youth Group of Randolph County, Ill., in a survey of occupations, health, education, opportunities, and leisure time.

Six months after commencement: An analysis of the occupational roles of 133,651 graduates from Washington high schools, classes of 1934 through 1941, P. H. LANDIS (*Washington Sta. Bul.* 420 (1942), pp. 31, figs. 9).—Presented are the occupational roles of some 133,651 school youth 6 mo. after graduation, 65,940 boys and 67,711 girls graduating from high schools of the State of Washington in the classes of 1934 through 1941. This group accounts for between 60 and 70 percent of all youth of comparable age in the State of Washington during the period covered.

Among the conclusions drawn from the study are the following:

"The proportion of youth going on to college is decidedly affected by economic and employment conditions. The highest proportion go on to college during a time of normal business activity. At the depth of the depression the proportion was relatively low; with the war boom, the proportion going to college dropped precipitously, although in 1941 it had not fallen to the depression level of 1934. It is clear that a large number of young men and women in their teens are either willing to dispense with a college education or to defer it when the labor market is open to them. . . .

"The teen-age girls' largest gain in the labor market during the war period has been in the field of store and office work. They apparently have taken the places of older workers who have been drawn into the armed service or into other employment. The proportion of girls entering factory work and trades has about doubled, but the proportion in these fields remained small even for the class of 1941.

"The war-time labor market has opened for boys primarily in the field of factory work and trades. They have also found more openings in store and office work than previously, but the new openings in this field have gone primarily to girls. The proportion of boys entering agriculture is decidedly affected by the expansion of the urban labor market. A smaller proportion of the 1941 class than of any other class entered agriculture.

"The marked difference in college attendance of rural and urban youth suggests that urban youth value higher education to a greater extent, find it more essential to success in the urban environment, or that some other conditions in the social situation tend to push them on up the educational ladder. Either rural youth do not sense these values to the same degree, do not feel the same pressures, or for some other reason less often try to continue their education beyond the high school. It is possible that nearness of urban youth to institutions of higher learning or more adequate family income are factors.

"It is the country youth primarily who finds his way into agriculture after completion of the high school course. Despite the fact that the very small schools less often than the small city schools offer a Smith-Hughes course in agriculture, a higher proportion of their youth return to the farm. This may not in all cases be a deliberate choice on the part of the rural youth. It may be in part that the school has not given many farm youth an adequate understanding of other occupational possibilities. Certainly, it is due in part to the fact that agriculture is the family occupational heritage of a large proportion of youth in small school systems."

The effect of status on attitudes in a New York rural community, L. S. BEE ([*New York*] *Cornell Sta., Mimeog. Bul. 6* (1942), pp. [4]+51, pls. 5).—On the basis of studies of "a rather typical upstate New York village and the center of a dairy farming area," the author concludes that factors associated with persons' positions in the economic system are very significantly related to conservatism and liberalism. Conservatism is closely correlated with relative advantaged economic position in the community, education, and other factors.

[**Farmers' discussion group pamphlets**] (*U. S. Dept. Agr., Ext. Serv. and Agr. Adjust. Admin.*, 1935, D-1, pp. II+9, rev. 1936, pp. II+11; 1935, D-2, pp. II+6, rev. 1936, pp. II+6; 1937, D-3, pp. [2]+22, figs. 7; *Bur. Agr. Econ.*, 1942, D-4, pp. IV+57, figs. 7; *Bur. Agr. Econ. and Ext. Serv.*, 1942, [D-5], pp. 13).—This is a series of pamphlets "to assist organizations and individuals interested in establishing discussion groups, particularly in rural areas." The series deals with a brief guide to methods, how to organize and conduct county forums, the discussion leader's job, group discussion and its technics (a bibliographical review), and the organization of groups for discussion and action.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

An evaluation study of the introductory course in soils at Michigan State College, L. M. TURK and P. L. DRESSEL (*Mich. State Col. Ed. Res. Bul. 1* (1942), pp. [2]+56, figs. 2).—This publication presents a record of the development and evaluation of the introductory course in soils. The results suggest that a somewhat different organization of the course, involving giving some of the applied phases in advance of the basic and technical parts, would make for more interest in the technical aspects.

Rural America today: Its schools and community life, G. A. WORKS and S. O. LESSER (*Chicago: Univ. Chicago Press*, 1942, pp. XX+450, figs. [20]).—This is a description of rural education in the United States.

Consumer education (*Philadelphia: Frank Parker*, 1942, rev. ed., pp. [3]+75).—This loose-leaf processed working outline for a consumer education course for secondary schools is arranged for two semesters, the first being devoted to consumer goods and the second to consumer services. Following introductory chapters of a more general nature, the study topics on specific goods and services are presented in outline form, with accompanying references to teaching materials.

FOODS—HUMAN NUTRITION

Food and family living, F. L. GORRELL, H. MCKAY, and F. ZUILL (*Chicago: J. B. Lippincott Co.*, [1942], pp. XI+522, [figs. 274]).—This textbook for high school students follows the same general scheme of presentation as used in *The Family's Food* (E. S. R., 79, p. 704) upon which the present edition is based, but with thorough revision, new illustrations, and attractive resetting. Throughout the several sections, dealing with (1) meal planning and preparation, (2) methods and standards of food preparation, (3) food management, and (4) relation of food to health, an effort is made to present food and nutrition problems in relation to daily living, both at home and in the workaday world.

A microscopic study of bread and dough, M. E. BURHANS and J. CLAPP (*Cereal Chem.*, 19 (1942), No. 2, pp. 196-216, figs. 36).—This paper reviews briefly some of the previous work in the field, discusses the problem of making suitable sections, and notes the main points of the adopted microscopic procedure. Thirty-six photomicrographs are presented in the series, beginning with the ingredients and following with the progression of dough samples taken after each operation

and terminating with the baked bread. The descriptions given are based on the three magnifications used routinely and concern the starch, yeast, gluten, fatty substances, and the gas cells produced by leavening. The causes and effects of the structural changes observed in the material during the manufacturing are discussed under six headings, which are summarized as follows:

"(1) Mixing results in an entirely homogeneous suspension of starch, yeast, and fats in a glutinous matrix. Flour particles lose their autonomy. (2) Processing improves the bread by grouping the starch and more efficiently sealing the gas pockets by gluten segregation. Molding and proofing are fundamental operations. (3) Baking changes, involving oven spring, starch gelatinization, coalescence of the lipides, and leavening are visually demonstrated in the photomicrographs. (4) Shortening distribution in bread dough is indicated by the technic used. The observations suggest a concentration of the shortening upon the starch-gluten interfaces, effected principally by mixing, and coalescing during baking into sizable collections of specifically stained material. (5) Leavening involves a preliminary diffusion away from the point of CO_2 formation. The heat of baking affects gas solubility, vaporization, enzymatic behavior, and gluten properties. (6) The crumb qualities (grain, texture, and to some extent color) are directly correlated with microscopic structures, particularly the small intramural gas cells."

Nutritive value of leafy vegetables, O. SHEETS, O. A. LEONARD, and L. McWHIRTER (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 11, pp. 1, 2).—Seven-Top turnip greens grown on a uniformly fertilized plat were harvested at from 7- to 10-day intervals, beginning about $1\frac{1}{2}$ mo. after planting, and analyzed for moisture, iron, carotene, and ascorbic acid. The data presented show that there was much variation in these constituents, apparently associated with growth and probably with weather conditions related to season. Thus, the early harvests were richer in iron and usually richer in carotene, in percentage of the dry sample, than the more mature leaves harvested at later dates. A decrease in ascorbic acid in the leaves appeared to be associated with freezing weather occurring in mid-December.

Factors influencing the nutritive value of the tomato: A review of the literature, K. C. HAMNER and L. A. MAYNARD (*U. S. Dept. Agr., Misc. Pub.* 502 (1942), pp. 23).—This publication reviews and summarizes published experimental work that has provided information regarding factors related to variations in total solids, acidity, pigments, mineral content, ascorbic acid, carotene, and other vitamins in tomatoes. The factors involved include location, season, temperature, light, water supply, variety, stage of development and maturity, and nutrition of the plant. Variations in ascorbic acid content of tomatoes during the canning process and the production of juices and other products are also considered. The bibliography totals 142 references.

Dietary uses of the banana in health and disease, L. J. BOGERT (*New York: United Fruit Co., [1942], rev. and enl., pp. 67, pl. 1, figs. 3*).—This booklet presents a brief review of the scientific literature covering the nutritive value of the banana and the clinical evidence of its dietary uses, the latter being interpreted in the light of modern nutrition. The present review (*E. S. R.*, 85, p. 412) has been amplified to cover the important papers which have appeared between 1939 and 1942.

Dehydrated baked beans, W. B. ESSELEN, JR., and S. G. DAVIS. (*Mass. Expt. Sta.*). (*Canner*, 95 (1942), No. 20, pp. 18, 20, figs. 2).—The beans are baked with a well-seasoned brine formula, since some of the flavor is lost during the drying, and are dried, after discarding the salt pork, in a forced circulation, hot-air tunnel dehydrator at a temperature of about 140°F . With a load of $1\frac{1}{4}$

lb. of baked beans per square foot of tray, the product is dried to a 3- to 4-percent moisture content in from 8 to 10 hr. The dehydrated beans are packaged in a moisture-vaporproof package. For rehydration they are soaked for about 1½ hr. in water added in the proportion of about 2 parts by weight to 1 of beans. The heated, rehydrated beans are characteristic of the original baked beans except that they are somewhat less attractive because of their tendency to split open during the dehydration.

Dehydration of sauerkraut, W. V. CRUESS, E. BALOG, and P. VAN HOLTEN. (Univ. Calif.). (*Canner*, 95 (1942), No. 24, pp. 13-14).—Blanching of sauerkraut, preferably steam blanching, before dehydration gave a product showing greater regain upon soaking and greater cooked weight than did the dehydrated unblanched sample, but it was gray and inferior in color. When the boiled sauerkraut juice was added to the steam-blanching sauerkraut dried to the "tough dry" but not the "brittle dry" stage, the partially dried sauerkraut readily soaked up the juice, and the dehydration could then be completed. This drying in juice increased the yield and nutritive value of the dehydrated sauerkraut and gave a product superior in flavor to that dried without juice. It was essential that the juice be boiled in order to destroy enzyme action, otherwise a dehydrated product of inferior flavor resulted. Other tests showed that exposure of the steam-blanching sauerkraut to SO₂ fumes for 20 min. before drying gave a final product of lighter color than the one not sulfured. Reduction in volume of the dehydrated product was accomplished by compressing the sauerkraut before completely dry and while still tough. The resulting "boards" about ½ in. thick could then be dehydrated to bone dryness (moisture less than 5 percent). Fresh sauerkraut containing 1.4 percent total acid as lactic gave dehydrated products, which, after soaking and cooking, contained (1) untreated, 0.48 percent; (2) dried with juice, 0.60; and (3) SO₂ treated, 0.50 percent total acid. Presumably acetic acid volatilized during drying.

Nutritional studies on powdered wool, J. I. ROUTH (*Jour. Nutr.*, 23 (1942), No. 2, pp. 125-130, figs. 3).—Wool, powdered by grinding in a ball mill, was incorporated at 15- and 20-percent levels as the sole source of protein in an otherwise adequate diet. In ad libitum feeding tests with young rats the powdered wool failed to support growth, whereas other rats of the same strain gained from 3 to 4 gm. per day when 15 percent casein replaced the wool. Tryptophan, methionine, histidine, and lysine were found to be present in suboptimal concentration in the powdered wool. Supplementation of the wool diet with these amino acids resulted in moderate growth.

Sugar substitutes and their uses, J. E. RICHARDSON (*Montana Sta. Cir.* 168 (1942), pp. [4]).—Suggestions are given for using honey, corn sirup, sorghum, or medium dark molasses in place of sugar in cake making. Some tested recipes are given showing the original proportions and the substitutions.

Foods and drugs, E. R. TOBEY (*Maine Sta. Off. Insp.* 183 (1942), pp. 153-280).—This annual report (E. S. R., 86, p. 700), giving the results of analyses of official samples of foods and drugs, is concerned chiefly with dairy products (milk, cream, and ice cream), packing oils for sardines, and shellfish (clams).

Co-operative research in nutrition, P. M. NELSON. (Iowa Expt. Sta.). (*Jour. Home Econ.*, 34 (1942), No. 8, pt. 1, pp. 528-530).—This is a brief report of the organization, scope, and significant findings to date of the north central cooperative project on the nutritional status of college women, reports of various phases of which have been noted from original sources.

Food production and nutrition, N. W. PIRIE (*Nature [London]*, 149 (1942), No. 3777 pp. 318-319).—This is a brief summary of papers presented and the ensuing discussion at a meeting of the British Nutrition Society devoted to the

topic **Food Production and Distribution in Relation to Nutritional Needs**. The formal papers presented were *The Agricultural Implications of a Food Policy Based on Nutritional Needs*, by J. Orr; *Rival Claims of Animals and Man for Food*, by N. C. Wright; *Animals as Food Converters*, by E. T. Halnan; and *Planning for Agricultural Production*, by J. Russell.

A scientific food policy (*Nature* [London], 149 (1942), No. 3777, pp. 309-311).—An editorial discussion of some of the problems involved in post-war food production planning as discussed in the symposium noted above.

What vegetable crops best meet the demands of a food emergency? J. H. MacGILLIVRAY, G. C. HANNA, and P. A. MINGES. (Univ. Calif.). (*Canner*, 95 (1942), No. 19, pp. 16-18).—It is pointed out that from the standpoint of agricultural wartime economy vegetables should be selected not merely for their nutritive value but with consideration for the amounts of food constituents produced per acre per man-hour. Other items, including palatability and consumer preference, are less important. In the present study the efficiency of 26 major crops is evaluated from existing information on composition, man-hour requirements, and average yields, the amounts of each food constituent per acre and per acre man-hour being determined for each crop. Yield ratings are determined by arranging the crops in descending order with respect to their yields of eight selected constituents (protein, calcium, iron, calories, vitamin A, thiamin, riboflavin, and ascorbic acid), and an index value of 1 is assigned to the vegetable rating highest in each group. The index values as determined for each vegetable with respect to the eight food constituents are added to give the final efficiency rating of the vegetable. The same procedure is followed in obtaining the rating for the amount of food produced per acre man-hour. Thus rated, spinach, winter squash, potatoes, and cabbage ranked as the best vegetables if the ratings for yield per acre and per acre man-hour were combined. The growing period, and hence the length of time the crop occupies the land, and the number of man-hours and length of time required to grow the seed are further considerations in evaluating the economy of a nutritionally important crop. It is concluded from the data presented that certain vegetable crops should possibly be eliminated from production if extreme economy of labor and equipment becomes necessary in the wartime food production program.

Nutrition survey of population groups: Report of a conference on methods and procedures (*Pub. Health Rpts.* [U. S.], 57 (1942), No. 6, pp. 189-194).—In this report of a conference held under the auspices of the Rockefeller Foundation and participated in by nine physicians with experience in this field, the results of the discussion have been condensed in the form of opinions and recommendations under the general headings dietary studies, clinical examination, and special tests in the assessment of the nutrition of populations. In summary the statement is made "that an assessment of the nutritional status of a population can be done at present by conducting, on a suitable sample, a properly planned dietary and food intake survey, together with an adequate physical and medical examination, the latter to include a slit-lamp examination of the eyes and the securing of blood samples for the determination of hemoglobin, plasma ascorbic acid concentration, and the concentration of blood serum or plasma albumin. While it is recognized that appraisal on this basis will give only partial information, more complete studies must await the development of additional methods."

Medical evaluation of nutritional status, VII, VIII (*Milbank Mem. Fund Quart.*, 20 (1942), No. 1, pp. 6182, fig. 1; pp. 83-96).—These two papers continue the series (E. S. R., 87, p. 741).

VII. Diets of high school students of low-income families in New York City, D. G. Wiehl.—Approximations of the diets of the individual high school students in the low-income group whose nutritional status has been noted in earlier papers of the series were calculated from the diet histories obtained by the interview method, both from the students at the clinic operated for the investigation and from home visits, and were compared with requirements for the principal food constituents as based on the National Research Council's daily allowances except for calories, for which calculations were made from age and estimated activity of the individual subjects. The percentages of the subjects of each sex and each age group with calculated diets furnishing less than the allowances recommended and also the percentages with diets furnishing less than two-thirds the recommended allowances are presented in graphs and tables.

In the first category 78 percent of the boys and 70 percent of the girls were classified as deficient in calories and 27 percent of the boys from 13 to 15 yr. of age and 52 percent of the girls from 16 to 19 yr. deficient in protein. For all of the other constituents more than 60 percent of the subjects in one or more of the sex-age groups had less than the recommended allowances. In the second category approximately 20 percent of all the subjects had diets furnishing less than two-thirds of the estimated requirements of calories; from 30 to 42 percent received less than two-thirds of the standard requirements for vitamin A; from 25 to 34 percent received less than two-thirds of the ascorbic acid requirement; and from 20 to 31 percent less than two-thirds of the calcium requirement. For iron, 26 percent of the younger and 32 percent of the older girls and 7 percent of the boys were in this group; for riboflavin 42 percent of the older boys and from 16 to 18 percent of the younger boys and all of the girls; and for thiamin 23 percent of the older boys and only 10 percent of the younger boys and the girls. The item showing the greatest deficiency was vitamin A; calcium and ascorbic acid ranked next in degree of deficiency; and the least deficiency was in protein.

Attention is called to observations reported in earlier papers of the series of the prevalence of avitaminosis A, ariboflavinosis, and low hemoglobin values in about one-fourth of the total group and low plasma ascorbic acid levels for the total. The high prevalence among the girls of diets considered to be deficient in iron was not confirmed by their hemoglobin levels, leading to the suggestion that an allowance of 15 mg. of iron daily may be questionable.

VIII. The school lunch as a method for improving diets of high school students, E. K. Stamm and D. G. Wiehl.—In connection with the dietary analyses noted above, a special analysis was made of the food values of lunches eaten at school either as free, bought, or brought from home. As these showed that for the most part the lunches contributed a smaller proportion of the nutrients in which most of the children were deficient than of others less frequently deficient, practical suggestions are given for increasing the nutritive value of the school lunches in constituents most likely to be deficient.

Nutritional requirements of children: A résumé, W. J. DANN and W. C. DAVISON (*Amer. Jour. Diseases Children*, 63 (1942), No. 2, pp. 366-370).—This résumé presents the daily allowances of the various dietary essentials for children, from under 1 yr. of age to 13-15 yr., as recommended by the committee on food and nutrition of the National Research Council (May 1941) and the committee on vitamins of the American Academy of Pediatrics. The discussion indicates briefly how these allowances may be met in dietary practice.

Army food and fighting efficiency, P. P. LOGAN (*Food Indus.*, 14 (1942), No. 5, pp. 33-36, figs. 3).—This address describes the work of the Subsistence Branch of the Quartermaster Corps of the U. S. Army in subsistence procure-

ment, research, and development. Types C, D, and K rations for reserve, emergency, and parachute use are described.

Food habits of South Carolina farm families, A. M. MOSER (*South Carolina Sta. Bul. 343 (1942), pp. 38, figs. 12*).—In this publication records of the food consumption of white and Negro farm families in the State are summarized and presented in semipopular form as the basis for recommending improvements in dietary planning. The material summarized includes the reports of studies made in the Piedmont (E. S. R., 73, p. 557) and the Lower Coastal Plains (E. S. R., 81, p. 866) areas and 401 weekly records from the consumer purchase study of the U. S. D. A. Bureau of Home Economics taken in the tobacco-cotton growing areas of the Upper and Lower Coastal Plains. In all, 669 records of white and 404 of Negro families fairly well distributed in different sections of the State were used.

The dietary patterns of white farm families in the Piedmont and Lower Coastal Plains sections are presented in graphs and tables in terms of average yearly consumption per person of milk, eggs, vegetables and fruits, lean meats, poultry and fish, grain products, fats, and sugars in low-cost and moderate-cost dietaries. The nutritive value of the diets is discussed in terms of standard allowances of the Board of Food and Nutrition of the National Research Council. Attention is called to seasonal variations and to home production of foods in these areas. Since the records of the tobacco cotton farms section did not cover all seasons, it was not possible to give a picture of the year's supply, but the average per capita quantities calculated for the low-cost and moderate-cost fall dietaries of white farm families are compared with those of the same season for the other two sections. From the records of Negro families, estimates are reported of the average per capita consumption of the different classes of foods for 26 weeks in the fall, as indicated by 49 weekly food records from the Piedmont, 91 from the Lower Coastal Plains, and 107 from the tobacco-cotton area.

The data for the various groups are further discussed as to frequency of good, fair, and poor dietaries of owner operators, tenant operators, and sharecroppers (or wage workers) among the white and Negro families, and finally from the average good dietaries of the Piedmont and Lower Coastal Plains groups, two types of farm family food plans are suggested and discussed—one suitable when plenty of milk is available and the other with less milk and more lean meat. This section of the report contains practical advice with respect to planning the food supply of individual families based on the dietary patterns proposed, with certain recommendations which, it is emphasized, should be followed to provide the necessary food values economically throughout the year.

Hematologic values for normal healthy men 16 to 25 years of age, C. J. HAMRE and M. H. AU. (*Hawaii Expt. Sta.*). (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 10, pp. 1231-1244, fig. 1).—The results of studies of normal values for the various blood elements for men are assembled from the literature and presented for comparison with the data obtained in determinations, by methods noted, of the blood values of 137 healthy young men residing in the Hawaiian Islands and ranging in age from 16 to 25 yr. These men were of several different races, the larger number being Caucasian, Chinese, and Japanese. Statistical evaluation of the data obtained indicated that age or race differences did not occur in any of the blood elements. Since the blood values obtained agreed closely with those in the summary of investigations in other parts of the world, it is concluded that blood values for men in the Hawaiian Islands do not differ significantly from those of men residing elsewhere. Fifty-nine references are given.

The role of diet in blood regeneration, A. BIESTER and J. M. LEICHSENBERG (*Minnesota Sta. Tech. Bul.* 153 (1942) pp. [1]+34, figs. 6).—The authors, with the collaboration of L. M. Burrill, L. M. Norris, and H. H. Deinard, in this bulletin present the results of an investigation dealing with the effects of certain nutrients and foods on the recovery of dogs from hemorrhagic anemia. The basal ration employed was that used in a previous study of the blood picture in hemorrhagic anemia in dogs (*E. S. R.*, 83, p. 140), and the criteria for assessing progress included hemoglobin and red cell volume regeneration, red cell count, and red cell size as measured by mean diameter and mean corpuscular volume.

"Hemoglobin production and red cell volume regeneration were most satisfactory when autoclaved yeast was introduced into the ration immediately following a control period on the synthetic food, and were least satisfactory when autoclaved yeast or wheat was included in the diet. When some essential material from autoclaved liver was supplied, apparently reserves built up during the control period became available. Confirming earlier studies on hemorrhagic anemia which has not been satisfactorily treated, red cell counts exceeded normal values and did not return to the desired level until cells of normal size were produced. Mean cell diameter and mean corpuscular volume values indicated a marked microcytosis at the beginning of each experimental period. Red cell diameter and mean corpuscular volume varied in opposite directions in many of the tests. Diameter showed the greatest increase when the diet included raw liver or liver which had not been heated above 100° C., and the greatest decrease in two series of experiments in which autoclaved liver was fed. The most striking increase in mean corpuscular volume occurred when thiamin was added to the autoclaved liver diet. Apparently the restoration of total red cell volume and hemoglobin is governed by a different set of factors from those which operate in return of red cell diameter or individual cell volume to prehemorrhagic levels."

The effect of operator on the variability of basal metabolism data, D. CEDERQUIST. (*Kans. Expt. Sta. and State Col.*). (*Jour. Lab. and Clin. Med.*, 27 (1942) No. 10, pp. 1328-1329).—A statistical study by analysis of variance of data obtained in 450 basal metabolism tests conducted by five operators on 225 women between 15 and 45 yr. of age under presumably standard conditions showed that intradaily variation was not the same for all technicians. The difference between the mean squares of the records of one technician on the same day was about 2½ times that of one of the other technicians, a difference of statistical significance. No definite explanation for the differences noted between technicians is offered, but the possibility is suggested that they may have been due to differences in the sensitivity of the operator to the interpretation of standard conditions.

Adequacy of simplified diets for guinea pigs and rabbits, A. G. HOGAN and J. W. HAMILTON. (*Mo. Expt. Sta.*). (*Jour. Nutr.*, 23 (1942), No. 6, pp. 533-543, figs. 2).—In continuation of earlier attempts to determine the nutritional requirements of rabbits (with a few preliminary trials with guinea pigs) by the use of simplified diets (*E. S. R.*, 72, p. 522), success has been achieved with respect to growth at a normal rate of both species on simplified diets in which from 5 to 15 percent of dried yeast or 10 percent of a water extract of dried liver was used as the source of all water-soluble vitamins. For successful reproduction and raising of the young additional vitamin K and vitamin E were required, but both species had normal growth without added vitamin K. When all of the water-soluble vitamins were supplied as the pure compounds now available, the rate of growth was subnormal and mortality was high.

The relation of the pH of intestinal contents to calcium and phosphorus utilization, J. H. JONES (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 557-567).—To determine whether the previously observed favorable influence of fat on calcium and phosphorus utilization (E. S. R., 86, p. 558) was due to the action of the fat in increasing the acidity of the intestinal tract, a study was made of the effect of a number of substances on the pH of the intestinal contents of rats and simultaneously on the calcification of bone. pH determinations made with a glass electrode pH meter on the pooled contents from corresponding intestinal sections of several animals showed that the distal one-fourth of the small intestines was the most alkaline portion of the intestinal tract. Lard, oleic acid, and vitamin D added to the rachitogenic diet increased the acidity in the lower ileum and less consistently in the cecum and colon. These substances showed definite antirachitic action, which was most pronounced in the case of vitamin D although it did not produce a lower intestinal pH than did lard or oleic acid. The addition of aluminum sulfate to a stock diet resulted in severe rickets and an increase in pH in most of the intestinal tract. The addition of dibasic phosphate protected the animals against rickets without changing the pH of the intestinal tract. Ammonium chloride, calcium chloride, and triacetin were without effect on the pH of intestinal contents or on calcification. Lactose produced as much acidity in the lower intestinal tract as did lard but did not show any antirachitic action. Oleic acid and sodium oleate effected similar pH reactions in the upper small intestines, but the acid produced the greater acidity in the lower ileum and exhibited a definite antirachitic action, whereas the soap did not. It is considered that these data do not definitely eliminate an increase in acidity as the method by which fats beneficially influence calcification, but that they do throw considerable doubt on this theory.

The interrelationship of calcium, phosphorus, and nitrogen in the metabolism of pre-school children, J. E. HAWKS, M. M. BRAY, M. O. WILDE, and M. DYE. (Mich. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 3, pp. 283-294).—Previous studies (E. S. R., 84, p. 271) dealt with the effect of increasing the protein content of the diet on the protein and caloric utilization of five preschool children receiving, during 15- to 24-day periods, diets containing, first, 3 and then 4 gm. protein per kilogram of body weight. For two children, whole egg, meat, and milk were used to increase the N content of the diet, while for the others egg white and gelatin were used. Data, obtained in these studies, on the Ca, P, and N balances of the children are here presented, and the interrelationships are summarized as follows:

"The higher protein diet had no effect on calcium absorption or retention. It caused a decrease in the absorption of phosphorus, but there was a better utilization of the amount available. There was an increase in both nitrogen absorption and retention. Weight gains were greater on the 4- than on the 3-gm. protein diet and represented different types of tissue growth. Decided increases in nitrogen retentions and significant changes in retention ratios for Ca : P, N : Ca, N : total P, and N : nonosseous P suggested that muscle and other soft tissue accounted for the greater proportion of the increased weight gains. There may have been additional bone growth in three children who had increased calcium retentions."

The authors were assisted by V. H. Wiltgen and A. Kirkpatrick.

Vitamin content of honeys, M. H. HAYDAK, L. S. PALMER, M. C. TANQUARY, and A. E. VIVINO. (Minn. Expt. Sta.). (*Jour. Nutr.*, 23 (1942) No. 6, pp. 581-588).—Thiamin, determined by the method of Hennessy and Cerecedo (E. S. R., 82, p. 588), averaged 5.5 ± 0.250 $\mu\text{g.}$ per 100 gm. in 29 samples of honeys from different localities in Minnesota; 31 honeys from different regions of the United States and representing various nectar sources varied from 2.1 to 9.1 $\mu\text{g.}$ per

100 gm.; and 7 honey samples from foreign regions varied from 2.2 to 9.1 μ g. per 100 gm. of thiamin. Values obtained for other vitamins per 100 gm. of these same samples, respectively, were as follows: Riboflavin, determined by the method of Snell and Strong (E. S. R., 82, p. 587), 61.0 ± 2.474 , from 35 to 137, and from 47 to 145 μ g.; pyridoxin, determined by the Scudi method (E. S. R., 87, p. 11), 299.0 ± 11.457 , from 210 to 480, and from 240 to 460 μ g.; pantothenic acid, by the method of Strong, Feeney, and Earle (E. S. R., 86, p. 588), 105.0 ± 5.54 , from 25 to 192, and from 50 to 150 μ g.; nicotinic acid, by the method of Melnick and Field (E. S. R., 86, p. 11), 36.0 ± 3.486 , from 4 to 92, and from 4 to 94 mg.; and ascorbic acid, by the Bessey method (E. S. R., 82, p. 14), 2.4 ± 0.155 , from 0.5 to 6.5, and from 1.3 to 2.8 mg. It is pointed out that the variable amount of the vitamins found in the different samples probably depends on the source of the honey and the number of pollen grains in the product. Clarification of honey with diatomaceous earth resulted in marked reduction in the vitamin contents, amounting to from one-third to almost one-half the original values.

Studies on the influence of vitamin A and vitamin C on certain immunological reactions in man, A. E. FELLER, L. B. ROBERTS, E. P. RALLI, and T. FRANCIS, JR. (*Jour. Clin. Invest.*, 21 (1942), No. 2, pp. 121-137, figs. 7).—In this very extensive investigation five human subjects were given a diet adequate in all factors except for the specific vitamin being studied, and during the period of observation, which extended for 14, 26, 20, 6, and 19 weeks, respectively, weekly or biweekly determinations were made of the content of vitamin A, carotene, and ascorbic acid in the plasma and in certain instances in the white blood cell platelet layer. At similar intervals for the individual subject observations were made on five immunological reactions selected because of their diversity and because each represented an antibacterial or antiviral phenomenon.

"The results of the various immunological tests were not significantly influenced by the following conditions: (1) Marked and prolonged changes in the plasma levels of vitamin A or vitamin C or abrupt rises in the concentration of vitamin A in the plasma (two patients); (2) severe deficiency in vitamin C followed by a period during which the subjects were flooded with the vitamin (two patients); (3) a period of 17 consecutive weeks on a regime deficient in vitamin A, followed by a period of 2 weeks during which the subject received large doses of the vitamin daily. Certain variations in the results of the immunological tests occurred, but these alterations were either no more marked than those occurring in normal persons or were adequately explained on some basis other than a deficiency or sufficiency of vitamin A or vitamin C."

The utilization of carotene and vitamin A in the rat, R. TREICHLER, A. R. KEMMERER, and G. S. FRAPS. (Tex. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 1, pp. 57-64).—In this attempt to throw further light on the relative availability of vitamin A and carotene, three series of experiments on weanling male rats were run. The first consisted of a comparison of the vitamin A storage in the livers of rats receiving for 14 days from weaning equivalent amounts (10 International Units daily) of vitamin A potency as found in cod-liver oil, carotene dissolved in cottonseed oil, and carotene as contained in alfalfa leaf meal. In the second the effect was determined of the length of the depletion period (2 weeks and 4 weeks) on the vitamin A storage in the liver. In the third a comparison was made of the storage of vitamin A in the liver during 7 days on the basal diet of the other two series and the same with yeast replaced by an equal weight of cornstarch. The paired feeding technic was used throughout, vitamin A was determined by the spectrographic method of Fraps and Kemmerer (E. S. R., 79, p. 100), and the data were treated statistically by the analysis of variance.

Increased retention of vitamin A was found in all diet groups over the values of the controls at the beginning. The increase was greatest in the animals receiving their vitamin A in cod-liver oil, next in those receiving carotene in cottonseed oil, and least in those on alfalfa meal. On the basis of 100 percent efficiency for cod-liver oil, the efficiencies of the other sources were 59 and 21 percent, respectively, with carotene in alfalfa meal only 35 percent as effective as carotene dissolved in cottonseed oil. All differences were significant, as was the increase in the vitamin A storage in the negative controls. This was traced in the third series to the presence in yeast of a substance capable of giving a false or pseudo vitamin A value. The necessity in such experiments of using the paired feeding technic is emphasized.

Vitamin A and dark-adaptation: Effect of alcohol, benzedrine, and vitamin C. S. YUDKIN (*Lancet* [London], 1941, II, No. 26, pp. 787-791, figs. 6).—Normal variations in dark adaptation and in vitamin A content of the blood were found to be as follows:

Final rod thresholds for any subject varied by about 0.2 log unit from day to day, or about 0.1 log unit in a few hours and hardly at all in 1 hr.; the cone threshold varied by about 0.3 log unit from day to day and about 0.2 log unit over shorter periods; the rod-cone transition time varied up to about 2 min. from day to day but less than 1 min. in 1 day; the resting level of vitamin A in the blood varied by about ± 5 percent over periods of days or weeks and was not affected by food; and variations in dark adaptation and blood vitamin A were found to be quite independent and might be in opposite directions.

To determine whether or not a case of clinical night blindness is due to vitamin A deficiency, the author recommends that, following a preliminary dark-adaptation test, large doses (about 100,000 International Units of vitamin A) be given daily for 10 days, and a dark-adaptation test 24 hr. after the last dose. An improvement in dark adaptation lasting more than 24 hr. after the tenth dose indicates that the night blindness is due to deficiency of vitamin A. If no improvement occurs, another dose is given and dark-adaptation tests are made at intervals during the following 24 hr. If no transient response occurs, it can be assumed that the night blindness is not due to lack of vitamin A. No relation was found between the degree of night blindness and the dose required to produce a definite cure. In single subjects dark-adaptation tests and blood vitamin A determinations during dosing with vitamin A led to the conclusion that in any subject there is a critical level of blood vitamin A below which there is a subnormal rod threshold, but that the threshold is not affected by a blood vitamin A higher than the critical level. Both alcohol and benzedrine produced transient improvement in dark adaptation with no corresponding rise in vitamin A. Ascorbic acid was without effect even in subjects shown to be deficient in this vitamin.

The relation between dark adaptation and the level of vitamin A in the blood. C. HAIG and A. J. PATEK, JR. (*Jour. Clin. Invest.*, 21 (1942), No. 4, pp. 377-383, figs. 2).—Data are reported and discussed on (1) 60 individual dark adaptation tests (Hecht apparatus) made on 37 normal persons between the ages of 20 and 45 yr., (2) the plasma vitamin A and total carotenoid levels in 44 normal persons, and (3) 67 simultaneous dark adaptation and plasma vitamin A and carotenoid measurements on 14 normal persons, 18 patients with cirrhosis of the liver, and 7 with various other chronic diseases.

In (1) no sex differential was found in dark adaptation, but in (2) the mean vitamin A plasma levels for the women were found to be 14 percent lower than for the men and the mean carotenoid levels the same. In (3) when the cirrhotic and normal groups were considered separately, no significant correlations were found between either the plasma vitamin A or carotenoid levels and the dark

adaptation values, but when all of the subjects were grouped together some degree of correlation was evident. In discussing these findings with reference to earlier work of the authors and others, it is suggested that when various complicating factors are excluded, dark adaptation values may be considered a measure of the utilization of vitamin A by the retina, while vitamin A in the blood is an index of the amount stored in the liver.

The effect of the level of fat in the diet upon utilization of vitamin A, K. D. MUELDER and E. KELLY. (Mich. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 4, pp. 335-344).—In this second phase of an investigation of the effect of single factors on the utilization of vitamin A by the rat (E. S. R., 85, p. 700), it was found that the inclusion of fat at a level of 10 percent of the basal diet resulted in significant gains in weight over those on the basal diet alone but not over those on the diet containing 5 percent fat. For the levels of fat and vitamin A used, the level of vitamin A proved to be a more important factor than that of dietary fat in producing highly significant gains in weight. Growth in length was not affected by changes in the fat level, but was significantly increased by increased vitamin A. Fat had no significant effect at the levels fed, and vitamin A at all levels decreased the incidence of abscesses.

Studies of the B vitamins in the human subject, I-V (*Amer. Jour. Med. Sci.*, 202 (1941), No. 4, pp. 502-512, figs. 7; 512-516, figs. 2; 203 (1942), Nos. 1, pp. 114-120; 3, pp. 388-397, fig. 1; 4, pp. 569-577, fig. 1).

I. *The intake of thiamine and its relation to other dietary constituents in food selected by the normal subject*, K. O. Elsom and T. E. Machella.—In a selected group of seven essentially normal women who were allowed to select freely from an adequate diet for a period of from 15 to 39 days, during which all of the food eaten was weighed for diet calculations of thiamin content (with occasional analyses), the thiamin requirements of the individual subjects were calculated according to the Cowgill formula for comparisons with actual intake, and 24-hr. urines were analyzed for thiamin excretion. For the group as a whole the average daily intake exceeded the theoretical requirement by 40 percent, but the individual intakes ranged from 6 to 115 percent above the requirement. There was a wide variation in intake, not only among the different subjects but also from day to day in the same individual, the variations in both cases being due to the food habits of the individual. A linear relationship was found to exist between the daily intakes of protein and of thiamin, a positive correlation but of lesser degree between fat and thiamin intake, but no correlation between carbohydrate or calorie intake and thiamin.

II. *Urinary excretion of ingested thiamine in patients with chronic hepatic disease*, T. E. Machella and K. O. Elsom.—Six women, three of whom were normal and the others had clinical and laboratory evidence of chronic hepatic disease, were maintained for from 16 to 37 days (after a preliminary observation period of 2 weeks) on a diet calculated to meet the individual thiamin requirements and were then given supplementary doses of thiamin up to as much as 1,000 μ g. daily. The 24-hour excretions of thiamin were determined throughout. On the unsupplemented diet there was no essential difference between the patients with hepatic disease and the controls in the percentage of ingested thiamin excreted in the urine, but on the supplemented diet the excretion was much less in the patients than in the controls. Three possibilities are suggested for the lessened excretion of thiamin—disturbed renal function, previous state of tissue unsaturation, and impaired absorption from the intestinal tract. Impaired absorption is considered the most likely cause. The authors had the technical assistance of C. S. Chornock.

III. *The response of cheilosis to vitamin therapy*, T. E. Machella.—Among 17 cases of cheilosis treated in different ways, the lesions of 8 of 13 treated with pyridoxin subsided within from 3 to 14 days and of another in 26 days. The 4 not responding to pyridoxin also failed to respond to riboflavin, which, in addition, proved ineffective in the 4 other cases. In 3 with clinical and laboratory evidence of scurvy, improvement in the lip lesions was shown only when the scorbutic state had been corrected by vitamin C. The observations are thought to indicate that cheilosis is not necessarily a manifestation of riboflavin deficiency alone.

IV. *Mental changes in experimental deficiency*, H. E. O'Shea and K. O. Elsom.—In this study in which the authors had the technical assistance of R. V. Higbe, eight women, four of whom were on an adequate diet and the others on the basal diet of the earlier studies supplemented with one-half of the theoretical requirement of the B vitamins, were subjected to various psychological tests. From the data obtained the authors conclude that "foresight and judgment, as measured by performance on maze tests, are impaired when the subjects are deficient in the B vitamins and are improved after therapy with thiamin or with the B complex. General intelligence, reasoning ability (reading), and speed of hand muscle coordination (tapping) show no measurable deterioration when the subjects are deficient in the B vitamins and no improvement after therapy with thiamin or with the B complex.

V. *The normal requirement for thiamine; some factors influencing its utilization and excretion*, K. O. Elsom, J. G. Reinhold, J. T. L. Nicholson, and C. Chornock.—Observations were carried out to determine whether or not the minimal requirement of thiamin is accurately determined by the Cowgill formula. Six women were maintained on a diet containing thiamin slightly in excess of the theoretical requirements and three on essentially the same diet except for the B vitamins, which were given in amounts supplying approximately half of their theoretical requirements. The 24-hr. excretion of thiamin was determined in all cases. Of the six receiving the calculated theoretical requirements, three remained well and three developed symptoms of the deficiency. As the latter group were all of small body weight and consequently received less of the vitamin than the others, it is suggested that the influence of body weight on requirement is less important than suggested by Cowgill. The absolute thiamin intake compatible with health in these subjects was about 651 μ g. and the thiamin:calorie ratio about 0.35. The quantity of thiamin excreted varied appreciably from day to day independently of the volume of urine and was proportional to the intake but independent of the body weight. The excretion was lowered in one case in the presence of infection and returned to normal when the infection subsided.

Choline deficiency in rats of various ages, R. W. ENGEL. (Ala. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 193-196).—Weanling rats placed on a diet severely deficient in choline but otherwise adequate (E. S. R., 86, p. 420) were given choline chloride at levels of 4 or 5 mg. daily. While there was considerable individual as well as litter variation in the response of the animals, it appeared that about 5 mg. of choline chloride daily was necessary to prevent the fatal hemorrhagic kidney disease in weanling rats on a diet severely deficient in choline. The choline deficiency was produced within from 7 to 14 days at any time during the rapidly growing period when choline was omitted from the diet. Weanling rats kept on the stock diet for periods of 3 or 5 weeks were somewhat less susceptible to choline deficiency than rats fed the diet low in choline and supplemented with 20 mg. of choline chloride daily for similar periods.

The relation of B-vitamins and dietary fat to the lipotropic action of choline, R. W. ENGEL. (Ala. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 2, pp. 175-185).—"When thiamin, riboflavin, pantothenic acid, pyridoxin, corn oil, and choline were fed to rats receiving a purified diet containing 18 percent of casein for a 3-week experimental period, an abnormal accumulation of liver fat resulted. Under these conditions 2 mg. of choline chloride per rat daily failed to prevent the kidney hemorrhages of choline deficiency; at least 10 mg. of choline chloride was necessary for this factor to exert its maximum lipotropic action, but normal liver-fat levels were still not obtained. The addition of 3 mg. of inositol per rat daily to the diet adequate in choline and containing the above B vitamins reduced the liver fat to the normal level found in rats receiving an adequate stock diet. Prolonged feeding of a diet deficient in pyridoxin or essential fatty acids resulted in fatty livers, even though the diet contained adequate choline. It is concluded that pyridoxin and a source of essential fatty acids are necessary in the diet for choline to function properly as a lipotropic agent. Inositol, in addition to choline, is a necessary dietary constituent for the rat receiving purified diets supplemented with the other B vitamins known to be required by this species."

Enrichment of white bread with vitamin B complex through the addition of debitterized brewers' yeast, R. SCHWARZ, S. and L. LAUFER, and M. W. BRENNER (*Indus. and Engin. Chem.*, 34 (1942), No. 4, pp. 480-483, fig. 1).—A commercial dry, debitterized brewers' yeast at levels of 2.5, 5.0, and 7.5 percent (in terms of bread solids) was incorporated in doughs of white breads which were prepared and scored by an experienced baking laboratory. The bread with the 2.5 percent yeast was equal in quality to the control made with no addition of brewers' yeast, but additions of increasing amounts of the yeast exerted some unfavorable influences on the bread quality. The 2.5-percent yeast bread contained 1.50, 0.879, 6.92, and 2.10 mg. of thiamin, riboflavin, nicotinic acid, and pantothenic acid, respectively, per pound of bread as received (37.3 percent moisture). The corresponding values for the control bread with no brewers' yeast were 0.168, 0.451, 2.76, and 1.64 mg. per pound. These values agreed within the limits of experimental error with those obtained by calculation from the analytical values for the bread ingredients.

Three commercial breads, representing ordinary white bread, enriched white bread, and a special process bread believed to be baked from the flour prepared by the flotation process, were analyzed and found to contain, respectively (on a per pound basis as received), 0.361, 1.05, and 1.47 mg. of thiamin, 0.386, 0.406, and 0.820 mg. of riboflavin, 3.31, 6.23, and 15.1 mg. of nicotinic acid, and 1.66, 1.81, and 2.40 mg. of pantothenic acid. It is suggested on the basis of the present tests that consideration should be given to the addition of dried debitterized brewers' yeast to flour for the purpose of fortifying baked goods with vitamin B complex.

The effects of biotin upon fat synthesis and metabolism, G. GAVIN and E. W. McHENRY (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 619-625, fig. 1).—Evidence is presented, following similar methodology to that of an earlier study (E. S. R., 84, p. 700), suggesting that biotin is the active factor in the alcohol-soluble fraction of beef liver responsible for the formation in the rat of fatty livers containing a high cholesterol content (E. S. R., 85, p. 413).

Synthesis of vitamin B₁ by yeast, J. M. VAN LANEN, H. P. BROQUIST, M. J. JOHNSON, I. L. BALDWIN, and W. H. PETERSON. (Wis. Expt. Sta.). (*Indus. and Engin. Chem.*, 34 (1942), No. 10, pp. 1244-1247).—Several strains of yeast were used, the one employed in most of the experiments and best able to synthesize thiamin from the intermediates being a strain from commercial high-

thiamin bakers' yeast. The yeasts were maintained on a basic medium sterilized by a method described and composed of beet molasses, steep water, diastatic malt extract, diammonium phosphate, and distilled water. With the addition of synthetic thiamin to an aerated suspension of the growing or resting yeast cells, most of the thiamin was taken up by these cells. If the amount of thiamin present was in excess of the quantity necessary to raise the yeast to about 3 mg. per gram, a large part of the thiamin was not absorbed; however, by the addition of very large amounts of thiamin to the medium, yeast containing 6 mg. of thiamin per gram could be produced. When yeast was grown in the presence of the pyrimidine and thiazole portions of the thiamin molecule, thiamin was synthesized by the yeast. The efficiency of the conversion was from 70 to 90 percent provided the thiamin content of the yeast did not rise above 800 μ g. per gram. In yeast grown without aeration, the efficiency of conversion was low. Nonproliferating yeast cells, under aeration, converted pyrimidine and thiazole into thiamin almost quantitatively. The presence of spent wort was beneficial. The pyrimidine portion of thiamin was more readily synthesized by yeast than the thiazole portion. None of a large number of compounds tested was able to replace either pyrimidine or thiazole in thiamin synthesis by yeast.

The nicotinic acid content of cereal products, J. M. THOMAS, A. F. BINA, and E. B. BROWN (*Cereal Chem.*, 19 (1942), No. 2, pp. 173-180).—Nicotinic acid was determined by the method of Bina et al. (*E. S. R.*, 87, p. 13). Ash, protein, and moisture were also determined in most of the materials analyzed. The nicotinic acid content of a typical Kansas winter wheat mix (6.01 mg. per pound) was only 62.9 percent of that of a typical spring wheat mix (9.56 mg. per pound). From analyses and data on milling yields of the mill fractions of the spring wheat mix, it was determined that the patent and first and second clear flours combined contained approximately one-third and the mill feeds approximately two-thirds of the nicotinic acid of the wheat. The percentage of the wheat vitamin in the individual mill products increased as the ash content increased; bran, with a nicotinic acid content of 31.22 mg. per pound, contained the largest proportion (30.66 percent). In a series of cereal and legume seeds, spring wheat and soybeans, containing, respectively, 10.83 and 10.04 mg. of the vitamin per pound of dry solids, were the richest in nicotinic acid, while oats contained the lowest amount (3.66 mg. per pound of dry matter) and corn almost the same (3.70 mg.). Whole-wheat flours showed less nicotinic acid (6.23-7.44 mg. per pound) than ground whole wheats, indicating some refinement in the course of the milling. The nicotinic acid content of whole-wheat bread (4.08-5.25 mg. per pound, 34 percent moisture basis) was above that in white bread (1.90-2.42 mg.), but considerably below that in enriched white bread (8.50-9.96 mg.). Bakers' yeast and enriched bakers' yeast contained, respectively, about 55-60 and 550 mg. of nicotinic acid per pound, 70 percent moisture basis.

Studies in nicotinic acid metabolism.—V, A test for nicotinic acid deficiency in man, W. A. PERLZWEIG, H. P. SARETT, and L. H. MARGOLIS (*Jour. Amer. Med. Assoc.*, 118 (1942), No. 1, pp. 28-30, fig. 1).—The test consists essentially in determining the 24-hr. excretion of nicotinic acid and trigonelline before and after the ingestion of a 500-mg. test dose of nicotinamide. The subjects are instructed to omit for 3 days before the test all coffee and all leguminous vegetables and nuts because of their trigonelline content. The nicotinic acid content of the urine is not affected significantly by the test dose of nicotinic acid, but the trigonelline content of the urine is proportional to the adequacy of the nicotinic acid. In the cases studied 24 normal subjects gave an extra excretion of trigonelline under the conditions described amounting to 90 mg., 53 rather undernourished subjects from a N. Y. A. rehabilitation camp 63, and a group of

63 miscellaneous hospital subjects 41 mg. The authors had the technical assistance of M. Stenhouse and F. Spilman.

Nicotinic acid, pantothenic acid, and pyridoxine in wheat and wheat products, L. J. TEPLY, F. M. STRONG, and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Jour. Nutr.*, 24 (1942), No. 2, pp. 167-174).—Fifty-five samples of wheat varying as to variety and source were assayed for nicotinic acid by the microbiological method of Snell and Wright (*E. S. R.*, 87, p. 12) applied to autoclaved NaOH treated suspensions of the samples, for pantothenic acid by the microbiological method of Strong, Feeney, and Earle (*E. S. R.*, 86, p. 588) applied to autoclaved water suspensions of the samples, and for pyridoxin determined by the biological method of Conger and Elvehjem (*E. S. R.*, 86, p. 427). Values for these three vitamins, respectively, expressed in micrograms per gram, averaged 59 μ g. (range 47-106 μ g. per gram), 13.3 (9.1-17.5), and 4.6 (3.2-6.3 μ g.). Patent flour, clear flours, and wheat germ were also assayed for these vitamins. Patent flour compared with whole wheat contained about one-sixth as much nicotinic acid and about one-half as much pantothenic acid and pyridoxin.

Riboflavin content of some common foods, H. E. MUNSELL. (*Food Res.*, 7 (1942), No. 2, pp. 85-95).—Riboflavin was determined by a rat-growth method in which the animals were brought to a constant or declining weight on a riboflavin-free diet and then divided into four groups of litter-mate animals of comparable weight. To these were allotted, respectively, supplements of pure riboflavin (3 μ g. per rat per day) and of the test substance at three different levels estimated as sufficient to furnish 3 μ g., less than 3 but more than 1 μ g., and more than 4 but less than 8 μ g. of riboflavin per rat per day. After a 3- or 4-week test period, the average gains in weight of the three assay groups plotted against the amounts of test material fed as a daily supplement gave a curve from which was read the amount of test material corresponding to the average gain in weight of the control animals receiving the 3- μ g. supplement of riboflavin.

The values obtained for the riboflavin content of 20 food items, purchased in small quantities periodically from local retail stores, together with data obtained by other investigators, are summarized. The foods, described briefly as to the nature of the samples, were representative of the different food groups. The highest value for riboflavin content (545-600 μ g. per 100 gm.) was obtained for Cheddar cheese, followed by that for dried navy beans (300-324 μ g.), and eggs (306-320 μ g.). Beef, pork, and fish (salmon) muscle, and milk each assayed more than 200 μ g. per 100 gm. Among the green leafy vegetables, spinach and the leaves of broccoli gave very high values (371-460 μ g.); green peas (200 μ g.), endive (187-214 μ g.), and green string beans (107-115 μ g.) were next in order; and green winter cabbage (38 μ g.), green peppers (30 μ g.), and Iceberg or New York type lettuce (less than 25 μ g.) were low. Roots and tubers were uniformly low (25-71 μ g. per 100 gm.), and the whole cereals (whole wheat and rolled oats) were intermediate (100 μ g. per 100 gm.).

Thiamin retention in self-rising flour biscuits, R. A. BARACKMAN (*Cereal Chem.*, 19 (1942), No. 1, pp. 121-128; *abs. in Northwest. Miller*, 209 (1942), No. 10, Sect. 2, pp. 3a, 20a-21a, fig. 1).—The self-rising flour and biscuits were prepared essentially by official procedures (*E. S. R.*, 86, p. 441), and thiamin was determined on the air-dried, ground biscuits by the thiochrome method. The tests involved the determination of the amount of added synthetic thiamin hydrochloride recovered in the baked biscuit irrespective of the native thiamin as determined in biscuits baked without the added vitamin. In accordance with the standards for enriched flour (*E. S. R.*, 86, p. 552), the vitamin for the recovery tests was added to the flour at the level at 2.16 mg. per pound. Preliminary trials showed that the vitamin recovery was not affected by certain

variations in baking conditions and in methods of dough preparation. Biscuits of normal size resulted in 88-percent recovery, whereas only a 79-percent recovery was attained when the biscuits were thin and crusty. The thiamin content of the crust was found to be less than that of the crumb, the respective values obtained in one assay being 2.46 and 3.10 μg . per gram of air-dried product. Overbaking to give deeply browned or burned crusts decreased thiamin recovery. Biscuits made with milk showed better thiamin retention than those made with water. Biscuits made from self-rising flours containing varying ratios of soda and phosphate showed thiamin recoveries in proportion to the acidity of the biscuits. Under conditions favorable to the optimum preservation of thiamin, that is, with the pH no greater than 7.1-7.2 during the baking process, from 80 to 85 percent of the added thiamin was retained. It was shown that modification of present standard self-rising flour formulas to include 0.25 percent of additional calcium acid phosphate (preferably the anhydrous type) would result in optimum retention.

Thiamine, riboflavin, pyridoxine, and pantothenate deficiencies as affecting the appetite and growth of the albino rat, L. VOIS, A. BLACK, R. W. SWIFT, and C. E. FRENCH. (Pa. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 6, pp. 555-566, fig. 1).—In this study of the effect of moderate deficiencies of single water-soluble vitamins on growth and on the appetite of young rats, the paired feeding technic (with equalized food intake) was used, one animal in each of 10 litter pairs for each test receiving a complete synthetic diet and the other the same diet except for the following reduced allowances of the specified vitamins: Thiamin 1 μg ., riboflavin 1, pyridoxin 0.5, and calcium pantothenate 2 μg . A similar comparison was made between the basal diet and the same diet plus 0.2 percent of liver extract. The experiment lasted for 10 weeks, during which time it was found necessary to increase somewhat the quantity of thiamin and of calcium pantothenate in the deficient diets.

All four vitamins had a definite but unlike effect on the appetite. "With insufficient thiamin the appetite of the rat would drop to submaintenance levels and the disinterest in eating would continue until additional thiamin was provided. With insufficient riboflavin the appetite depression appeared to be the result of a general physiological debility of an unspecific nature. With insufficient pyridoxin there were sudden and temporary lapses in appetite, followed by an equally prompt recovery. Pantothenate anorexia seemed to follow the pattern of riboflavin insufficiency." Food consumption of the female rats was reduced 27 percent for the low thiamin, 20 for riboflavin, 34 for pyridoxin, and 27 percent for calcium pantothenate. Growth curves for the paired animals in the thiamin comparison were practically parallel when both sexes were considered together, with the odds only 18 to 1 that thiamin had an effect on growth. However, the difference for the females was significant, with odds of 2,000 to 1. For the other vitamins the odds were 3,000 to 1 for riboflavin, 50 to 1 for pyridoxin, and 200 to 1 for pantothenic acid.

The authors conclude that riboflavin, pyridoxin, and pantothenic acid have specific growth-promoting effects unrelated to appetite and that this is also true for the thiamin in the case of females but not of males. Neither appetite nor growth was improved by the addition of liver extract to the basal diet.

The occurrence of fits in pyridoxine deficient rats, S. LEPKOVSKY, M. E. KRAUSE, and M. K. DIMICK. (Univ. Calif. et al.). (*Science*, 95 (1942), No. 2465, pp. 331-332).—The findings of Chick et al. (*E. S. R.*, 85, p. 856) that epilepticlike fits may occur in pyridoxin-deficient rats are confirmed, and the possibility is suggested that disturbed water metabolism may be involved. It is noted that convulsions were never observed in animals under 4½ mo. of age and

then only rarely until from 6 to 8 mo., when they occurred more frequently and with gradually increasing duration.

A convulsive syndrome in young rats associated with pyridoxine deficiency. E. P. DANIEL, O. L. KLINE, and C. D. TOLLE (*Jour. Nutr.*, 23 (1942), No. 3, pp. 205-216).—A convulsive syndrome, previously (E. S. R., 80, p. 562) shown to occur in young rats during the suckling stage when nursed by mothers on the basal diet used in the U. S. P. method of assay for thiamin (E. S. R., 85, p. 152) supplemented with thiamin, has been shown to be a specific result of pyridoxin deficiency.

The syndrome was cured or prevented by the administration of crystalline pyridoxin to the young. When suckling young of mothers on a stock diet were transferred to lactating rats on the deficient diet a rapid depletion of pyridoxin reserves was obtained, as was also the case when the mothers were transferred during lactation from a stock diet to one deficient in pyridoxin. No injury was observed in females maintained on pyridoxin-restricted diets through pregnancy and lactation, and there was no failure in lactation, although the pyridoxin content of the milk was reduced to such an extent that the convulsive syndrome developed in the young. Attention is called to the similarity in symptoms of pyridoxin deficiency in rats with those reported by Chick et al. in young pigs (E. S. R., 82, p. 663) and in mature rats (E. S. R., 85, p. 856) maintained on synthetic diets deprived of pyridoxin.

Vitamin C, carotene, calcium, and phosphorus in expressed vegetable juice. M. E. PUFFER, W. F. HINMAN, H. CHARLEY, and E. G. HALLIDAY (*Food Res.*, 7 (1942), No. 2, pp. 140-143).—Juices from a number of vegetables were expressed with a metal hand-turned juicer of an inexpensive type being sold for home use. The juicing time was in general from 3 to 5 min. for from 2 to 4 oz. of juice, and the yields were as follows: Celery 57-71 percent, cabbage 50-78, green beans 40-48, spinach 35-58, and carrots 20-33 percent. The juices were unattractive in color and in flavor. Determinations made on the vegetables and on the juices showed that the freshly expressed juices contained from 8 to 69 percent of the reduced ascorbic acid, from 22 to 36 percent of the carotene, from 15 to 90 percent of the calcium, and from 24 to 62 percent of the phosphorus of the whole vegetable. Much of the nutritional value of the vegetable would thus be lost if only the juice were used. Weight for weight, however, the juices were almost as good sources of the nutritional elements as were the whole vegetables. In none of the juices studied was there any loss of carotene upon standing, but the reduced ascorbic acid content was appreciably decreased.

The ascorbic acid (vitamin C) content of rhubarb. E. N. TODHUNTER (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 437-440).—Hothouse and field-grown rhubarb of two varieties received at the stage of prime maturity for harvesting was analyzed over two seasons for ascorbic acid content by the method of Bessey (E. S. R., 82, p. 14) for the Evelyn photoelectric colorimeter. These analyses were made on composite samples of center sections from several stalks. Analyses were also made of cooked samples of rhubarb, using the whole stalks sufficient to give 450 gm., and baking these, after sectioning and covering with sirup, in a covered Pyrex dish at 350° F. for 30 min. Sections from stem and leaf ends of other fresh stalks of these same varieties were also analyzed. A summary of the data from the various determinations showed the ascorbic acid content of fresh rhubarb grown in the hothouse to range from 3.5 to 5.8 mg. per 100 gm. for the Victoria variety and from 5.8 to 6.7 mg. for the Wine variety. The field-grown product contained from 6.8 to 8.0 mg. for the Victoria variety and from 6.5 to 16.7 mg. per 100 gm. for the Wine variety.

The leaf end of the rhubarb stalk was higher in ascorbic acid than the stem end. The cooked rhubarb of the Wine variety averaged 5.0 and 4.3 mg. ascorbic acid per 100 gm. for the hothouse and field-grown lots, respectively; corresponding values for the Victoria variety were 2.4 and 4.5 mg., respectively. When these values were calculated to the fresh weight basis, with due allowance for added water and sugar, it was apparent that there had been practically no destruction of ascorbic acid in the process of baking the rhubarb in a covered dish.

Effect of mineral nutrition on the ascorbic-acid content of the tomato, K. C. HAMNER, C. B. LYON, and C. L. HAMNER. (U. S. D. A.). (*Bot. Gaz.*, 103 (1942), No. 3, pp. 586-616, figs. 13).—In four experiments with the Bonny Best variety in sand culture, growth and fruitfulness could be correlated with minor variations in nutrients. The gross appearances of plants grown in 87 different solutions are discussed, and quantitative data are reduced and analyzed statistically. In general, variations in Ca and nitrate produced greater differences in growth and fruitfulness over wider ranges of concentrations than were obvious with the other elements. Interactions of the effects of various elements were noted. The ascorbic-acid content of the fruit was significantly higher in some sulfate-deficient treatments and significantly lower in K and phosphate deficiencies than average values. Except for these cases, no demonstrable effects of mineral supply on ascorbic acid were observed. Plants grown during fall and winter produced fruit with about one-half as much ascorbic acid as those grown during summer. The location where the plants were grown affected the ascorbic-acid content of the fruit, but these effects could not be correlated with differences among the soils and appeared to be associated with environal differences at the top of the plants. Significant positional effects on ascorbic-acid content, even in a relatively small trial plot, were observed. Plants grown in sand culture supplied with a balanced nutrient solution produced fruit as high (or higher) in ascorbic acid as that obtained on good soil. Several other observations are included on the effects of variations in mineral nutrition on growth and fruitfulness and of environal influences on the ascorbic-acid content, and a discussion of the possible practical significance of the results is included.

The influence of diet on the ascorbic acid requirement of premature infants, M. DANN. (Cornell Univ.). (*Jour. Clin. Invest.*, 21 (1942), No. 2, pp. 139-144, fig. 1).—Ascorbic acid saturation tests were given to two groups of 11 premature infants each. The subjects in one group receiving boiled breast milk gave ascorbic acid plasma values ranging from 1.3 to 3.5, with an average of 1.9 mg. percent 4 hr. after a test dose of either 100 mg. of ascorbic acid intramuscularly or 200 mg. by mouth. The values for the other group, which received artificial formula feedings, ranged from 0.1 to 1.6, with an average of 0.8 mg. percent. In explanation of the higher degree of saturation of ascorbic acid in the tissues of the infants receiving human milk, the suggestion is made that an increased daily requirement for vitamin C is related to the higher content of protein in cow's milk. It is estimated that the amount of milk given to these infants would furnish from 2.6 to 2.8 gm. of protein per kilogram of body weight in the human milk and from 4.6 to 6.1 gm. per kilogram in the cow's milk. Attention is called to evidence in the literature that ascorbic acid is concerned with the intermediary metabolism of aromatic amino acids.

The daily intake of ascorbic acid required to maintain adequate and optimal levels of this vitamin in blood plasma, M. L. FINCKE and V. L. LANDQUIST. (Oreg. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 5, pp. 483-490).—In this study, in which the authors had the technical assistance of P. M. Carpenter, a plasma ascorbic acid level of 0.8 mg. per 100 cc. was taken as the criterion for an adequate state of nutrition with respect to vitamin C, and the daily require-

ment to meet this criterion was determined for five college students, with results of 38–49, 49, and 61 mg., respectively, for the three women and 69 and 89 mg. for the two men subjects. These values corresponded to daily ascorbic acid intakes of from 0.8 to 1.2 mg. per kilogram body weight, with an average of 1.0 ± 0.14 mg.

In determining the requirements for tissue saturation two criteria were tested—(1) the lowest excretion in 24 hr. after a test dose of 400 mg. when the subject was known to be in saturation as determined by the method of Belser et al. (E. S. R., 82, p. 428), and (2) the lowest blood plasma level when the subject was in known saturation. In testing four women subjects by these criteria, the first proved unsatisfactory, for in only one instance did the excretion of ascorbic acid in response to the test dose parallel the previous intake. The second criterion proved more satisfactory, and the amounts of ascorbic acid required to meet this criterion in three of the women subjects were 111, 111, and 131 mg., respectively, or 1.7, 1.8, and 2.0 mg. per kilogram body weight.

The rate of increase of blood plasma ascorbic acid after ingestion of ascorbic acid (vitamin C), E. N. TODD HUNTER, R. C. ROBBINS, and J. A. MCINTOSH. (Wash. Expt. Sta. et al.). (*Jour. Nutr.*, 23 (1942), No. 3, pp. 309–319, fig. 1).—The course of ascorbic acid in blood plasma following the ingestion of 50 mg. of ascorbic acid from different sources and as influenced by various factors was studied in five college women. Blood samples were taken just before and 15 and 30 min. after a breakfast of toast and coffee with the given supplement and at half-hour intervals thereafter through noon, with determinations for each supplement on 3 different days.

The ascorbic acid of the plasma began to rise within from 30 to 60 min. following the ingestion of the supplement and returned to the fasting level in from 3 to 4 hr. The maximum increase took place within $1\frac{1}{2}$ hr. for crystalline ascorbic acid, orange juice, and orange sections, in 2 hr. for strawberries, and in $2\frac{1}{2}$ hr. for raw cauliflower. The same subjects showed the same general picture of absorption rates in three separate tests, and for four of the subjects of different height and weight there was close agreement in the absorption rate and time of reaching the maximum values. Iron salts in the form of 6 gr. of ferrous sulfate or an equivalent amount of iron as ferric ammonium sulfate taken at the same time as the 50-mg. dose of ascorbic acid had no effect on the plasma ascorbic acid in two subjects and a slight delaying effect in one. A high-fat intake (50 gm. of butter) was without effect. Low fasting levels of ascorbic acid decreased the amount but not the time of increase in plasma levels following the test dose. At a fasting level of 0.5 mg. or less per 100 cc. of plasma there was no increase following the ingestion of 50 mg. of ascorbic acid. When the intake was raised to 400 mg., there was a greater increase in plasma concentration and a longer time elapsed before return to the original fasting level.

The relation between plasma and dietary ascorbic acid, A. H. BRYAN, D. F. TURNER, R. L. HUENEMANN, and G. LOTWIN (*Amer. Jour. Med. Sci.*, 202 (1941), No. 1, pp. 77–83, figs. 2).—Scatter-point diagrams of daily ascorbic acid intakes per kilogram body weight (estimated partly from food composition tables and partly from original data) plotted against fasting blood plasma ascorbic acid levels are given in two charts—one covering 41 correlations for 36 individual subjects and the other these same correlations plus 24 others on 20 additional subjects whose dietary records were less accurate than those in group 1. The charts, particularly the first, show a more or less linear relationship between the dietary intakes and plasma ascorbic acid levels until they approximate from 1.7 to 1.9 mg. per kilogram body weight and 1.0 mg. per 100 cc. plasma, respectively. On plotting the plasma levels against daily ascorbic acid intakes both per square meter of body surface and per 100 calories of calculated basal metab-

olism, similar correlations were obtained, but the total average ascorbic acid intakes without reference to body weight plotted against plasma levels gave a wide scatter of points. It is concluded that the daily intake of ascorbic acid necessary to stabilize a normal individual at a given level of plasma concentration may be predicted, and that the determination of the fasting plasma ascorbic acid affords a useful objective method of characterizing the diet of the normal individual in regard to previous vitamin C intake.

The oral ascorbic acid tolerance test and its application to senile and schizophrenic patients, E. SIOTZ, B. M. SHINNERS, and R. A. CHITTICK (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 4, pp. 518-526, figs. 4).—In the test recommended a blood sample is taken fasting, preferably in the morning, a test dose of ascorbic acid in amounts of 6 mg. per kilogram body weight is given, and blood samples are again taken at intervals up to 5 hr. All of the samples are analyzed for ascorbic acid, and the data are plotted as curves of ascorbic acid against time. A breakfast of a cup of coffee and plain toast may be taken after the test dose.

On the basis of 60 such determinations and changes produced with supplementary feeding and deprivation of ascorbic acid, the authors suggest four degrees of relative saturation—saturated, high normal, low normal, and undersaturated. Type I or saturated curves are characterized by a high initial value (about 1 mg. per 100 cc. or over), a moderate rise following a test dose, and a failure to return to the initial level; type II by variable initial levels (from about 0.35 to 1 mg.), a marked rise in all cases, and variations in the rate of fall; type III by relatively low fasting levels (0.35-0.7 mg. per 100 cc.), only slight rises following the test dose, and return to the original level by the fifth hour; and type IV by no rise following the test dose. It was found possible to change the curves from type I₁ to type IV and the reverse, respectively, by ascorbic acid deprivation and by daily administration of large amounts of ascorbic acid over considerable periods of time. Type IV curves were found for five senile patients, and all were changed to type I by the administration of 200 mg. of ascorbic acid daily for 2 weeks. The deficiencies in these subjects were attributed to senility rather than old age, as other elderly patients on the same diet but not showing signs of senility had normal values. It is suggested that extra ascorbic acid be given to senile patients. In a group of 20 schizophrenic patients no indications of vitamin C deficiency were found.

Ascorbic acid excretion at known levels of intake as related to capillary resistance, dietary estimates, and human requirements, T. LEVCOWICH and E. L. BATCHELDER. (R. I. Expt. Sta.). (*Jour. Nutr.*, 23 (1942), No. 4, pp. 399-408).—In an extension of earlier studies reported by Mitchell et al. (*E. S. R.*, 81, p. 148), comparisons were made of the range of 24-hr. urinary ascorbic acid excretion of college women students on their customary freely chosen diets with that of a group of students maintained, after a saturation period, on a basal diet furnishing only 5 mg. of ascorbic acid and supplemented with 50 mg. of ascorbic acid daily. The values for the latter group ranged from 17 to 29, with an average of 22 mg. Of the 56 determinations in the former group, 27 came within the same range. Calculations of the ascorbic acid content of the diets of these subjects, however, gave estimated intakes of from 44 to 253, with an average of 121 mg. daily. Inasmuch as the excretion values of these presumably healthy subjects were in the same range as the excretion on 50 mg. of ascorbic acid, the authors conclude that 50 mg. may be considered the minimal requirement of ascorbic acid for moderately active young women, but suggest a safety factor of 50 percent. They point out, moreover, that the calculated ascorbic acid content of the foods in a freely chosen diet tends to

be overestimated and may lead to a false sense of security as to vitamin C intake.

Capillary fragility tests were made on two of the subjects during the last 3 days of each test period following different levels of ascorbic acid intake. Although the capillary resistance was not significantly affected by variation in the ascorbic acid intake over an extended period of time, the petechiae became larger in size, although not changing in number. This is thought to suggest that the vitamin C-free diet used may have been lacking in vitamin P or some other factor affecting capillary fragility.

Vitamin C and wound healing.—I, Experimental wounds in guinea pigs. II, Ascorbic acid content and tensile strength of healing wounds, in human beings. M. K. BARTLETT, C. M. JONES, and A. E. RYAN (*New England Jour. Med.*, 226 (1942), No. 12, pp. 469-473, figs. 3; pp. 474-481, figs. 9).—In the first part of this investigation the concentration of ascorbic acid in healing wounds in guinea pigs was determined under a variety of dietary conditions and correlated with the tensile strength of these wounds. The dietary conditions included (1) preoperative (2 weeks) and postoperative low vitamin C, (2) preoperative and postoperative high, (3) preoperative low and postoperative high, and (4) preoperative high and postoperative low vitamin C. At the time of operation biopsy material was analyzed for ascorbic acid in comparison with the later autopsy material.

In (1) the biopsy and autopsy tissues were both low in ascorbic acid, with no increase in the healing wound; in (2) both were high, with a marked increase in the healing wound; in (3) the biopsy material was low and the autopsy high; and in (4) the biopsy material was high and the autopsy not much higher than in (1). The tensile strength of the wounds examined 10 days postoperatively was much greater in those with a high than a low vitamin C content.

It is concluded that in these animals the tissue levels of ascorbic acid resulting from the preoperative administration of vitamin C are of much less importance in establishing optimum ascorbic acid of the healing wound than vitamin C intake during postoperative treatment.

In part 2 information was sought to supplement the work of Crandon, Lund, and Dill (*E. S. R.*, 88, p. 871) on the value of vitamin C in wound healing in human beings by means of direct observations on the tensile strength of healing wounds and a correlation of these with the tissue and plasma ascorbic acid content. The studies were carried out on five patients operated on for unilateral hernia and one for bilateral hernias. During the preoperative period the patients received the equivalent of 100 mg. of ascorbic acid daily in the hospital diet, and supplemental ascorbic acid was given to some before and after the operation. Plasma ascorbic acid and 24-hr. urinary excretion were determined throughout the period, and samples of the skin and fasciae were taken for analysis before and 10 days after the operation. The subject with bilateral inguinal hernias afforded an opportunity for contrasting ascorbic acid treatment in the two operations. In the first no ascorbic acid was given postoperatively and in the second 1,000 mg. daily was given. In the first group the control biopsies of the fasciae gave ascorbic acid values from 0.11 to 0.48, with an average of 0.25 mg. per 100 gm., and the skin biopsy material an average value of 1.35 mg. The healing fascia values ranged from 3.88 to 7.65 mg. per 100 gm., with an average of 6.01 mg. The tensile strength of the fasciae varied from 1,100 to 2,400, with an average of 1,600 gm. The subject with bilateral hernias had the following values in connection with the operation without and with additional ascorbic acid, respectively: Preoperative plasma ascorbic acid 0.09 and 0.07 mg. per 100 cc., control biopsy material 0.0 and 0.0,

10-day-old scar tissue 0.67 and 6.77 mg. per 100 gm., and tensile strength 400 and 1,200 gm. This evidence indicates that "in spite of a low plasma ascorbic acid level at the time of operation, normal wound healing may be produced by adequate vitamin C therapy during the postoperative period."

Criteria of response in the bio-assay of vitamin E, K. E. MASON (*Jour. Nutr.*, 23 (1942), No. 1, pp. 59-70).—The studies reported concern the attempts to evaluate recognized gradations in negative and positive responses to vitamin E administration, based upon the number of live fetuses and the weight of the uterine contents on the sixteenth day of pregnancy, in assay tests on 600 rats. The results were not much superior to those obtained by treating responses as an "all or none" type, except for the recognition of a subminimal type of response otherwise classed as negative. The presence of two or more viable fetuses in utero at the sixteenth day of pregnancy afforded, however, a criterion of response essentially equivalent to, and in some cases more reliable than, that based upon delivery of progeny at term. Examination of the uterus at the sixteenth day gave information especially pertinent to critical levels of response and prevented misinterpretation of certain atypical uterine states as negative responses to dose.

Distribution of vitamin E in the tissues of the rat, K. E. MASON (*Jour. Nutr.*, 23 (1942), No. 1, pp. 71-81).—A total of 338 bio-assay tests were conducted on tissues of rats receiving approximately 4, 100, and 10,000 times the minimal daily requirement of vitamin E. At the low (suboptimal) intake, the heart, lung, and spleen contained almost twice as much vitamin E per gram of fresh tissues as did the muscles, body fat, and other visceral organs, and about 4 times as much as the liver. At moderately high levels of intake the storage in the viscera, muscles, and body fat was increased from 3 to 4½ times, with the heart, lung, and spleen receiving more than other tissues, and with the amount in the liver being increased about 14 times. The mammary gland concentrated about twice as much E as the liver. At excessively high levels of intake the muscles and liver, respectively, showed about 12 and 150 times the vitamin E storage observed at the low level of intake. The liver content of the vitamin afforded the most useful measure of the previous intake and storage. The total storage of vitamin E in the rat body represented but a small fraction of that ingested.

Symposium on fortified food (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 1 (1942), No. 3, pp. 324-351, *figs.* 4).—At this symposium, held at the 1942 meeting of the American Institute of Nutrition, the following topics were reviewed: Definitions and Standards of Identity for Food, by E. M. Nelson (pp. 321-327); Food Consumption Studies and Dietary Recommendations, by H. K. Stiebeling (pp. 327-330) (U. S. D. A.); Clinical Observations Bearing on Food Requirements, by E. S. Gordon (pp. 330-335) (Univ. Wis.); Guiding Principles for the Fortification of Foods, by F. C. Bing (pp. 336-342); and The Laboratory Control of Enriched Foods, by B. L. Oser (pp. 343-351). Numerous references to the literature are cited in the three latter reviews.

The fortification of foods, A. F. MORGAN. (Univ. Calif.). (*Med. Woman's Jour.*, 49 (1942), No. 4, pp. 145-150).—This discussion deals with the classes of vitamins and vitaminized products, namely, synthetic vitamins, concentrates, concentrates plus crystalline vitamins, naturally rich products not usually used as foods, natural products plus concentrates or synthetic vitamins, and processed foods to which vitamins are added to restore them to their original level. Also considered are standards and units of the several vitamins; arguments for, and the advantages of, use of fortification in foods and the use of vitamin pills and

concentrates v. a diet of natural foods; and the disadvantages in the use of fortified food and vitamin pills.

Combating dietary deficiencies with enriched and fortified foods, E. J. LEASE, R. C. RINGROSE, and J. G. LEASE (*South Carolina Sta. Cir.* 62 (1942), pp. 8).—It is pointed out that fortification of staple foods offers exceptional promise in the South as a means of combating the vitamin and mineral deficiencies of the diet of a considerable percentage of the population. This existing malnutrition is due to fixed eating habits, limited educational advancement, and low economic status of these people; to the lowered nutritional value of foods produced on soil of low fertility; and to other conditions. Increased cost of living, shortage of labor, shortage of commercial fertilizers, and relatively high prices for cotton, all prevailing at present, tend to limit the variety of foods for many people and to result in an even less adequate diet. In the past these conditions have increased the incidence of pellagra. It seems important, therefore, for the duration of the war at least, to fortify staple foods consumed in large quantities by the masses of people as a means of eliminating certain nutritional deficiencies. Because of large-scale production, the cost of certain synthetic vitamins has been reduced to the point where their use for such fortification is feasible. State legislation requiring the enrichment of bread and flour and the fortification of margarine has been enacted in South Carolina and Louisiana in order to obtain widespread enrichment of these staple foods. It is pointed out that, for the South in particular, the enrichment of corn meal and grits would bring about further improvement in the nutritional status of many people consuming restricted diets.

Symposium on deficiency diseases (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 1 (1942), No. 3, pp. 292-323, figs. 7).—The following topics were reviewed, with numerous references to the literature: Some Specific Physiological Disturbances Induced by Marginal Vitamin Deficiencies (C and B₁), by C. G. King (pp. 293-296); Foods as Sources of the Vitamins, by F. C. Bing (pp. 296-303); The Biological Action of the Vitamins, by C. A. Elvehjem (pp. 304-309) (Univ. Wis.); Vitamins as Pharmacological Agents, by H. Molitor (pp. 309-315); Vitamins in the Practice of Medicine, by N. Jolliffe and R. Goodhart (pp. 313-319); and Vitamins and Public Health, by W. H. Sebrell (pp. 319-323).

The prevalence of malnutrition, N. JOLLIFFE, J. S. McLESTER, and H. C. SHERMAN (*Jour. Amer. Med. Assoc.*, 118 (1942), No. 12, pp. 944-950).—In this evaluation of existing evidence on the prevalence of malnutrition in the United States, the terms nutritional failure, dietary inadequacy, nutritional inadequacy, and malnutrition are first defined, following which evidence is summarized of three kinds—(1) food consumption records or dietary surveys, (2) official death rates and hospital admission figures, and (3) medical assessments of the nutritional status in samples of the population. For purposes of comparison the material summarized is tabulated, with accompanying literature references on gross evidences of malnutrition, prevalence of secondary (iron deficiency) anemia, and prevalence of ascorbic acid depletion. "The evidence at our disposal warrants the conclusion that dietary inadequacies and malnutrition of varying degrees are of frequent occurrence in the United States, and that the nutritional status of an appreciable part of the population can be distinctly improved. If optimal nutrition is sought, not mere adequacy, then widespread improvement is possible."

Diseases of nutrition: Review of certain recent contributions, H. R. BUTT, W. V. LEARY, and R. M. WILDER (*Arch. Int. Med.*, 69 (1942), No. 2, pp. 277-343).—This review, covering the literature of 1941 with a few late 1940 references, is devoted almost entirely to the vitamins, which are considered as to their

chemical and physiological properties, methods of measuring the specific deficiency, and role in health and disease, including clinical uses. The literature references, numbering over 300, are given as footnotes. The review closes with a discussion of the work of the Committee on Food and Nutrition of the National Research Council and the National Nutrition Conference for Defense, the final recommendations for which are listed.

The antirachitic effectiveness of fall and winter sunshine, G. C. WALLIS. (S. Dak. Expt. Sta.). (*S. Dak. Acad. Sci. Proc.*, 21 (1941), pp. 44-46).—In a study of vitamin D deficiency of dairy cattle, cows were depleted by early or late fall, at which times they were turned out for sunshine. With this change in management, the severe physical symptoms showed marked improvement in from 2 to 4 days, the low levels of blood calcium increased to normal in about 2 weeks, the negative calcium and phosphorus balances became positive and were maintained, and the vitamin D content of the butterfat, which was too low to be detected before sunshine exposure, increased to 0.20 International Unit per gram following exposure. This evidence, obtained in observations on three cows, supports the conclusion that the antirachitic effectiveness of late fall and winter sunshine may be more significant than previous observations and physical measurements of the amount of ultraviolet light reaching the earth's surface at this season might indicate.

Pantothenic acid absorption in pernicious anemia, C. E. MEYER, I. F. BURTON, and C. C. STURGIS (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 363-365).—In seven patients with pernicious anemia the pantothenic acid excretion, as determined in repeated tests before and after oral administration of 100 mg. of calcium pantothenate, averaged 4.4 and 13.1 mg. per 24 hr. These excretions were slightly but probably not significantly less than the corresponding excretions of 6.1 and 18.4 mg. by healthy individuals studied in the same manner. "This indicates there is no impairment of absorption of this compound in patients with pernicious anemia with which is always associated achlorhydria. The possibility must be considered, however, that the lack of hydrochloric acid may make the pantothenic acid in food less available for absorption."

Red staining of paws and whiskers as in vitamin B₂-complex deficient rats after dehydration, S. G. SMITH (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 691-693, fig. 1).—An earlier study of Smith and Sprunt (*E. S. R.*, 75, p. 888) suggesting that the red staining of the paws and whiskers of rats on diets deficient in some constituents of the B complex is related to dehydration, with later confirmation by Figge and Atkinson (*E. S. R.*, 87, p. 600), has been extended, with the technical assistance of T. E. Lasater, to determine if the B vitamins fed singly or together are capable of altering the course of development of these lesions resulting from dehydration. Two groups were fed Purina Dog Chow without water; five groups, the same supplemented with pantothenic acid (two groups), riboflavin, all of the B vitamins, and brewers' yeast, respectively; and three groups, water with no food. In all of the animals deprived of water, the accumulation of red porphyrin material began to appear on the third day and tended to increase progressively. The administration of riboflavin and pantothenic acid had no appreciable, and of the combination of synthetic vitamins or brewers' yeast only a minimal, effect. However, it is thought probable that these vitamins, particularly pantothenic acid and riboflavin, are concerned with water metabolism.

Nutrition as it affects tooth decay, J. D. BOYD (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 4, pp. 211-215).—This paper summarizes further findings (*E. S. R.*, 62, p. 595) concerning the serial dental status of diabetic children receiving a controlled diet for a period of years. The evidence, in some cases including

accumulated data sufficient for valid statistical analyses, indicated that both enamel and dentinal caries had been avoided or lessened in occurrence and in extent concurrently with dietary control. The diets recommended were designed to meet optimal nutritional needs of these children through foods suited to their capacity for utilization, and included daily the following: 1 qt. milk; one or two eggs; two 4-oz. servings succulent, leafy, and root vegetables; two 4-oz. servings fruit, one of which was orange or raw fruit (tomato used as a substitute); one serving meat, fish, fowl, or liver; one teaspoonful cod-liver oil; and supplementary foods such as potatoes, starches, bread and other cereal products, sweets, and fats in amounts sufficient to complete the caloric requirement for full activity. Such a diet supplied about half of the calories in the form of highly protective foods. The nature of the supplementary foods was not considered important provided they were acceptable to the child and did not replace any of the more valuable specified ingredients. It is pointed out that improvement of dietaries of the whole child population is called for to establish optimal states of nutrition, and that the resulting anticipated improvement in health and performance would reflect itself in various ways, including avoidance of tooth decay.

Effect of low calcium and vitamin D-deficient diet on bones and teeth of mature rats, A. P. LUND and W. D. ARMSTRONG. (Univ. Minn.). (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 363-365).—Twenty male albino rats raised to an age of 11 mo. on a stock diet were transferred for 5 weeks to a control diet adequate in vitamin D and containing 0.462 percent calcium and 0.458 percent phosphorus; of these animals 10 were then transferred to the experimental diet deficient in vitamin D and containing 0.007 percent calcium and 0.450 percent phosphorus, and the experiment was continued for 220 days, during which time calcium and phosphorus balances were determined over 10-day periods. Calcium and phosphorus balances were positive for the control animals, while the experimental animals exhibited a severely negative calcium balance and a positive phosphorus balance. Dissection of the experimental animals showed the alveolar bone in which the molars were embedded to be soft and friable, the alveolar crest resorbed, and the teeth loosened as compared with normal calcified alveolar bone and firmly fixed molars of the controls. The average volume of the humeri of the experimental animals did not differ from the controls, but the average density was 10.8 percent less than the controls. Calcium and phosphorus contents as percentage of dry fat-free bones did not significantly differ, however, between the two groups of animals. These results indicated that determinations reported in terms of weight percentage do not serve to distinguish osteoporotic from normal bone, but that the degree of osteoporosis can be described in terms of ash weight or mineral content related to unit volume of bone. Calcium and phosphorus analyses of the dentin indicated that no mineral had been lost by the molar teeth of the experimental animals. The mineral composition of the incisor teeth was not significantly different between the two groups of animals.

Human dental caries and topically applied fluorine.—A preliminary report, V. D. CHEYNE (*Jour. Amer. Dent. Assoc.*, 29 (1942), No. 5, pp. 804-807).—An aqueous solution containing 500 p. p. m. of $KF \cdot 2H_2O$ was topically applied, by a method preventing systemic ingestion, to the cleaned teeth of 27 children in the experimental group. These children and 19 of the control group ranged in age from about 4½ to 6 yr. All children received pre-phylaxis and examination upon initial and subsequent visits. The data obtained concerning the development and spread of carious lesions in the deciduous cuspid and molar teeth indicated that the application of fluorine in the manner described acted

more in suppressing carious activity in the existing lesions; the fluorine was effective, however, in preventing the development of new lesions.

Observations on induced dental caries in rats, I, II (*Jour. Dent. Res.*, 20 (1941), Nos. 2, pp. 97-105; 5, pp. 457-463, fig. 1).—Two papers are presented.

I. Reduction by fluorides and iodoacetic acid. F. J. McClure and F. A. Arnold, Jr.—The amount and degree of caries developing in young rats on a coarse corn meal caries-producing ration was observed in groups receiving, respectively, Galesburg, Ill., drinking water (E. S. R., 82, p. 713), Quincy, Ill., drinking water, water containing 2 p. p. m. F as NaF, and distilled water (control). The data obtained did not show any difference in the effects produced by these waters, but did point to a litter membership factor in rats with respect to their caries susceptibility. In other tests with rats on the caries-producing basal diet, it was found that the presence of 125 p. p. m. of F as NaF in the food or water and the presence of 200 p. p. m. of iodoacetic acid in the food, together with 20 p. p. m. of iodoacetic acid in the drinking water, significantly reduced the production of caries.

II. The effect of subcutaneous injection of fluorides. F. A. Arnold, Jr., and F. J. McClure.—Young rats placed at weaning on a noncaries-producing stock ration were transferred at somewhat more than 30 days of age to a caries-producing granulated corn meal ration. One group received drinking water containing 10 p. p. m. F as NaF, the control group received distilled water, and the injection group also received distilled water. Animals in the latter group received injections of 1 cc. of a solution of NaF equivalent to 0.5 mg. F every second day for the first 24 days and daily thereafter, making a total of 86 injections for each rat. Comparison of these groups with regard to their dental caries experiences indicated that the subcutaneous injection of NaF produced no significant reduction in induced dental caries. From observations on the injected rats it appeared that F, when introduced during the post-eruptive tooth period, exerted no systemic influence on induced rat caries. Analyses of the enamel and dentin of the incisor and erupted molar teeth of the rats showed that the F content of these tissues was increased by subcutaneous injection of the NaF and by feeding water containing 10 p. p. m. F. The higher F content of the molar teeth did not lead to increased resistance to caries.

Observations on induced caries in rats.—III, Effect of fluoride on rat caries and on composition of rats' teeth. F. J. McClure (*Jour. Nutr.*, 22 (1941), No. 4, pp. 391-398, figs. 2).—In continuation of this series of studies (noted above), control and test groups of rats aged from 23 to 25 days were placed on a corn meal caries-producing diet for 15 weeks, during which time the test rats received fluorine added to the drinking water or to the feed. A minimum of 10 p. p. m. F in the drinking water gave partial protection against occlusal caries, while about 80 percent protection resulted from both 50 and 100 p. p. m. F in the water and practically complete protection was afforded by 125 p. p. m. in the food. Since the observed action was not proportional to the fluoride deposited in the teeth, as determined by analysis of molar and incisor dentine and enamel, it is suggested that the caries-inhibiting action of the fluorine was by antienzymatic local action within the oral cavity. This view was substantiated by earlier findings that fluoride which did not reach the oral cavity, as when given by injection, was not caries inhibitory.

"The pooled molar teeth of groups of carious rats were not different from those of noncarious rats in content of ash, calcium, and phosphorus, and in fluorine which was deposited post eruptively. The post-eruptive addition of fluorine to rats' molar teeth occurred in relatively large quantities and is

regarded as occurring independent of oral enamel surface adsorption of fluoride. A significant effect of fluoride acquired after tooth eruption on induced rat caries was not evident."

Fluorine acquired by mature dog's teeth, F. J. McCLURE (*Science*, 95 (1942), No. 2462, p. 256).—Data are presented showing the increase in F content observed in the dentine and enamel of the teeth of a mature dog receiving fluorine in the food and drinking water for definite periods, each period terminating with the extraction of two or three comparable teeth. Each successive sample of dentine showed a decisive increase in F, but the enamel did not show a similarly consistent or equal percentage increase; the final concentration of F after a total of 559 days' exposure to the element was 0.072 percent in the dentine and 0.011 percent in the enamel. These results for the dog teeth, confirming similar results on young rats noted above, indicate that calcified dentine and enamel may undergo certain post-eruptive chemical modifications, and suggest that F retention may prove a useful tool in studying individual variation in dentine and enamel in relation to tooth age and susceptibility to dental caries.

Prevention of dental caries by massive doses of vitamin D, R. H. BRODSKY, B. SCHICK, and H. VOILMER (*Amer. Jour. Diseases Children*, 62 (1941), No. 6, pp. 1183-1187, fig. 1).—In 101 children, hospitalized for close study for 1 yr. because of tuberculosis or contact with a patient with the disease, observations were made concerning the incidence of dental caries as affected by a single massive dose of vitamin D. The children were divided into three groups. The control group, receiving only the hospital diet devoid of cod-liver oil or any other additional source of vitamin D, developed 39 cavities, or 1.18 new cavities per child during the observation period; a second group, receiving in addition to the hospital diet 305,000 U. S. P. units of vitamin D and 2,455,000 U. S. P. units of vitamin A in a fish-liver oil concentrate, developed 13 cavities, or 0.39 cavity per child; while the third group, receiving 600,000 U. S. P. units of vitamin D in the form of crystalline vitamin D₂ in oil in addition to the hospital diet developed only 6 cavities, or 0.17 cavity per child. These results suggest that incidence of dental caries may be markedly decreased by the administration of a single massive dose of vitamin D. None of the children showed any toxic manifestation after the administration of such a dose.

Serum phosphatase in experimental scurvy, H. SHWACHMAN and B. S. GOULD (*Jour. Nutr.*, 23 (1942), No. 3, pp. 271-281, figs. 2).—The activity of alkaline serum phosphatase was determined during the development and subsequent course of scurvy in guinea pigs and during treatment with varying amounts of ascorbic acid. Similar tests were made of serum acid phosphatase. During the feeding of a scurvy-producing diet, there was an immediate and continued decline to very low levels in the alkaline serum phosphatase, followed by alternate increases and decreases during periods of adding and omitting ascorbic acid. There was no apparent change in the serum acid phosphatase or serum inorganic phosphate. Rabbits, which are able to synthesize ascorbic acid, showed no decline in serum alkaline phosphatase when fed a scurvy-producing diet. No activation of low serum phosphatase by ascorbic acid occurred in vitro. The in vivo effect is thought to be due to an increase in enzyme production during recovery from scurvy.

The decomposition of pectin and galacturonic acid by intestinal bacteria, S. C. WERCH, R. W. JUNG, A. A. DAY, T. E. FRIEDEMANN, and A. C. IVY (*Jour. Infect. Diseases*, 70 (1942), No. 3, pp. 231-242).—The conclusion made earlier (E. S. R., 87, p. 142) that the decomposition of pectin in the colon must be due to micro-organisms is confirmed in this paper, which reports work on the

isolation and identification of the bacteria responsible for the enzymes involved, the products of decomposition, and the various pectinases used.

Suspensions of dog feces representing the residue of a general diet to which pectin had been added proved a less satisfactory medium for the isolation of pectin-decomposing bacteria than feces from a diet of pectin alone. A number of organisms capable of decomposing pectin were isolated, the more active of which were identified as belonging to the *Aerobacillus*, *Lactobacillus*, *Micrococcus*, and *Enterococcus* groups. Berkefeld filtrates of the organisms, as well as of feces suspensions, contained a heat-labile enzymelike substance. Certain organisms produced a pectinase-like or liquefying organism, others the same or a pectase-like coagulating enzyme. The filtrates of feces suspensions produced only liquefaction. An *Aerobacillus* strain and a mixture of *Micrococcus* and *Enterococcus* decomposed galacturonic acid, with formic and acetic acids as the chief end products. These were also the chief end points of the bacterial decomposition with, in addition, a small amount of galacturonic acid.

The graying of hair, A. HEDLICKA (*Jour. Amer. Med. Assoc.*, 118 (1942), No. 11, p. 918).—In this editorial it is pointed out (1) that the hair may be considered as a form of an organ serving, through its pigment, as a fairly important means of eliminating byproducts of metabolism, notably melanin, and (2) that the ordinary graying of hair signifies that less and less melanin is being formed and, therefore, less and less is present in the hair. While starvation or prolonged severe nervous stresses may conceivably diminish or stop production and hence the elimination of melanin, yet this effect would cease with restoration of normal conditions. "If the hair and its 'pigment' are viewed in this manner and the normal graying is regarded as a gradual decline in the production of melanin, it is difficult to see how any vitamin or other substance given to the subject could restore former conditions. Something of this nature could conceivably be possible for a time in the early stages of the process but would steadily grow more difficult with time until it became impossible. It would be in vain, it would appear, to expect now or in the future more from drugs or other substances than a possible delay of graying, or a partial halting of the process, with perhaps moderate restoration for a time, during the earlier stages of the graying period."

The immediate effect of cigarette smoking upon basal metabolic rates of university men and women, V. R. GODDARD and J. G. VOSS. (Univ. Calif.). (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 6, pp. 787-791).—The metabolism tests were conducted with standard precautions and procedures on college men and women accustomed to smoking either habitually or occasionally and selected at random from students apparently in good physical condition. The results presented show that the apparent basal metabolic rate determined approximately $\frac{1}{2}$ hr. after smoking may be either above or below the control test taken prior to smoking, and that the deviation is by no means constant. A rise in the pulse rate, respiration rate, and body temperature following smoking was generally observed. The sex of the subject apparently did not influence the energy output following smoking.

TEXTILES AND CLOTHING

Microscopic structure of flax and related bast fibers, C. W. HOCK (*Jour. Res. Natl. Bur. Standards [U. S.]*, 29 (1942), No. 1, pp. 41-50, figs. 12; also in *Amer. Dyestuff Rptr.*, 31 (1942), No. 14, pp. 334-342, figs. 12; abs. in *Textile Res.*, 12 (1942), No. 9, pp. 26-29, figs. 4).—Two varieties of *Linum usitatissimum* were used for most of the experiments, and most of the work was limited to fibers

that had received as few treatments as possible. Other samples of flax, hemp, ramie, and jute, including some commercially retted fibers, were used for comparison, however. In retting, the tissues of the flax were softened, permitting separation of the bast fibers contained in the outer cortex of the stem from the central woody core. The cambium layer, lying between these two regions, was softened first, followed later by softening of the thin-walled cells in the cortex. The flax fibers, as well as those obtained from hemp, jute, and ramie, were in the form of long filaments, each of which was made up of cells. In this respect they differed from cotton fibers which are single plant cells. The flax cell was observed to have a primary and a secondary wall. The former constituted the surface of each cell and consisted largely of wax and other material, presumably of a pectic nature. The secondary wall of cellulosic nature comprised the bulk of the fiber.

The experimental procedures used in studying the microscopic structure of the flax fiber included treatment of the raw and dewaxed fibers with cuprammonium reagent. In suitable dilutions this reagent did not completely dissolve the cellulose, but instead caused the fibers to swell considerably, thereby revealing many details of structure. Thus, the secondary wall was observed to be made up of innumerable cellulose fibrils, the outermost layer of which wound in one direction, whereas the majority of the fibrils beneath this layer wound in the opposite direction. These fibrils were grouped to give the wall a lamellar pattern. There was a greater number of these layers in the walls of the cells at the base of the stem than in the cells from the growing tip. There was also a corresponding increase in thickness of the wall from the tip of the stem where the cells originated to the base where they matured. All the bast fibers had essentially similar structures. Flax and ramie, however, differed from hemp and jute in the directions of orientation of the fibrils, and this accounted for some of the differences in the physical properties of the two groups.

Review on the structure of cellulose fibers, W. MARQUETTE (*Rayon Textile Mo.*, 23 (1942), No. 9, pp. 62-63).—This review deals with the controversial discussion concerning the physical organization of cellulose, as based upon the work of Farr (E. S. R., 87, p. 318) on the one hand, and of Hock and Harris (E. S. R., 85, p. 282) on the other, with independent supporting studies by various other investigators.

Elasticity of wool as related to its chemical structure, M. HARRIS, L. R. MIZELL, and L. FORT (*Jour. Res. Natl. Bur. Standards [U. S.]*, 29 (1942), No. 1, pp. 73-86, figs. 6; also in *Amer. Dyestuff Rptr.*, 31 (1942), No. 16, pp. 376-380, 392-394, figs. 6; *Indus. and Engin. Chem.*, 34 (1942), No. 7, pp. 833-838, figs. 6).—Observations were made on the elastic behavior of wool and of chemically modified wools in which the mode of linkage of the sulfur was altered without visibly affecting the fiber structure (E. S. R., 87, p. 157). The observed "long-range" elasticity of the wool is explained as due to the particular structure of the wool protein molecules, these being long flexible chains free to assume various shapes and, unlike those of other textile fibers, characterized by the presence of covalent disulfide cross links between the main molecular chains. These short cross links at intervals produce a three-dimensional or network structure, so that when wool is stretched or folded the chains, although they slide past one another, do not slide permanently out of position; rather, tensions are set up which cause the fiber to return to its original shape after the removal of the external force. In this respect wool is analogous to rubber in which cross chains are presumably formed during vulcanization. Thus the stress-strain, solubility, and swelling characteristics are greatly influenced by the extent of

the cross linking in the two materials. Rupture of the chemically modified wool decreased the strength of the fiber without necessarily affecting the elastic recovery. Rebuilding the covalent linkages largely restored the original properties of the fiber.

Volumetric determination of moisture in cotton textiles, J. F. KEATING and W. M. SCOTT. (U. S. D. A.). (*Amer. Dyestuff Rptr.*, 31 (1942), No. 13, pp. P308-P310, fig. 1).—The determination of water in mixtures by titration with the Karl Fischer reagent (containing iodine, sulfur dioxide, and pyridine dissolved in methanol) was successfully applied in the determination of moisture regain in cotton textiles by extraction of the fabric with cold methanol and subsequent titration of the water in the extract with the reagent. The titration procedure resulted in considerable saving of time, and the results obtained were more accurate than those obtained by the standard procedure of oven drying at 105°–110° C.

Rayon in first six months of 1942, W. C. APPLETON (*Rayon Textile Mo.*, 23 (1942), No. 7, p. 36).—Rayon, the production of which in the first 6 mo. of 1942 showed an increase of about 13 percent over that in the corresponding period in 1941, is finding increased use for military purposes. In addition to the established uses for linings, Army chevrons and insignia, self-sealing gasoline tanks, and tire cord, it has been adopted or employed on an increased scale for several types of parachutes, parachute shroud cords and tapes, aerial tow targets, electric wire covering, and Army sleeping bag linings. Spun rayons have been adopted for uniform interlining materials, heavy curtains for Navy ships, and for lint-free wiping cloths used by the Army and Navy for cleaning binoculars, range finders, and other types of high grade optical equipment. Rayon is also finding increased use in yarn and fabrics used by the Red Cross and for civilian purposes, increased use in the hosiery industry, and in the manufacture of rayon and wool blended fabrics.

Plastic-coated rayon yarns, H. R. MAUERSBERGER (*Rayon Textile Mo.*, 23 (1942), No. 8, p. 56, fig. 1).—This paper notes briefly the development, from French patents acquired in this country, of synthetic yarns known as "Plexon" yarns, "Cota-cord," and "Cota-tape." These are plastic-coated yarns, chiefly rayon filament yarns, of great flexibility and strength. The 17 different formulas now available allow for a wide latitude in finish and color (resistant to washing and light), and the thickness of the coatings, which may be single or multiple, can be controlled to 0.001 in. The yarns are not sticky, will not crack, are grease- and waterproof, may be flexible or rigid, and may be woven, knitted, braided, crocheted, and knotted on ordinary equipment now in common use. Applications seem to be unlimited, and at present table mats, millinery, hat bands, Chantilly lace, wide fabrics for draperies, shoe fabrics, and mesh fabrics for use as a substitute for screening are being made from Plexon.

Physical methods for evaluating the hand of fabrics and for determining the effects of certain textile finishing processes, E. C. DREBY (*Amer. Dyestuff Rptr.*, 31 (1942), No. 21, pp. P497-P504, figs. 7).—Of the eight physical properties of a fabric appreciated by the sense of touch, three proved to be the most important characteristics contributing to the 'hand' or 'feel' of soft-finished fabrics. These are flexibility, surface friction, and compressibility. The Planoflex [E. S. R., 86, p. 568], Friction-Meter, and Compression-Meter were developed for the evaluation of these respective properties. It was shown that these three properties were associated with the components of hand termed 'pliability,' 'smoothness,' and 'fullness,' and that they permitted the quantitative specification of hand. The Planoflex, Friction-Meter, and Compression-Meter are sensitive to small differences in finish, and in addition to their use in evaluating hand they

can be used to evaluate the effectiveness of different finishing agents, to control finishing processes, and to evaluate the effects of other factors affecting the hand of fabrics. The instruments are rugged and practical, making them suitable for routine textile testing. They are satisfactory for the measurement of all soft-finished woven fabrics."

Note on flexural fatigue of textiles, H. F. SCHIEFER and P. M. BOYLAND (*Jour. Res. Natl. Bur. Standards [U. S.]*, 29 (1942), No. 1, pp. 69-71, pls. 3).—The percentage decrease in breaking strength and elongation was observed in fabrics flexed under tension at the rate of 200 double folds per minute for a total of from 1,000 to 50,000 double folds. Microscopic observation of the flexed specimens indicated that the position of the failures of the fibers was in alternate yarns. This effect was entirely attributable to the differences in stress and strain arising from the fabric structure, the bending stress due to folding a given yarn increasing with increase in curvature of the fold. The percentage decrease in elongation and breaking strength depended upon the number of double folds and the kind of fiber. Fibers made from viscose rayon, Nylon, and cotton showed no decrease in elongation and breaking strength as compared with large decreases in fabrics made from acetate rayon, fortisan, and silk. This difference was not due to change in weave or fabric structure, but to structural differences in the yarns and in the fibers in the yarn. Thus, the short cotton fibers in the yarn were freer to move relative to one another when the fabric was flexed, and the fibers, therefore, were strained less when the yarn was bent. This resulted in an increase in folding endurance. The results of the study indicate that the ability of a textile fabric to withstand repeated flexing depends upon the structure of the fabric, the position and structure of the yarn in the fabric, and the kind of fiber from which the fabric is made.

Some factors affecting life of fabrics are explained by research on flexural fatigue, H. F. SCHIEFER and P. M. BOYLAND (*Textile Res.*, 12 (1942), No. 11, pp. 2-7, figs. 3).—Essentially noted above.

The sanitization of textiles: Investigation of self-antiseptic and self-sterilizing effects of treatment, L. H. JAMES. (Univ. Md.). (*Textile World*, 92 (1942), No. 6, pp. 86-87, figs. 3).—Tests, noted briefly, are interpreted as indicating that the solutions of commercial sanitizing materials used effectively inhibited growth, and even sterilized (reduced the bacterial content), sanitized materials inoculated with test organisms.

A study of towels and toweling for consumer use, N. G. BENNETT and P. E. KEENEY (*Missouri Sta. Bul.* 452 (1942), pp. 32).—As guides for judging the quality of terry cloth towels, tea towels, and toweling materials, obtained in various qualities and at various prices at representative stores in Missouri, laboratory tests were made to determine weight, tensile strength, thread count, colorfastness, and water absorption capacity. These findings as a guide to quality were compared with the guidance afforded the consumer by the usual methods of inspection, reliance upon trade-marks and brand names, past experience, and price. In the case of terry towels, in which strength and hence durability depended upon the number of yarns to the inch in the background of the towel and absorbability upon the weight, which involved length and closeness of pile, the usual buying guides were inadequate or inefficient. Price was no indication of quality, towels 22 by 24 in. in size, for example, costing from 18 ct. to \$1.50; trade-marks and brands served only to identify the manufacturer; and inspection served mainly to distinguish between the highest and the lowest grade, it being very difficult to distinguish between similar grades. While informative labels would be of advantage to the consumer, there were but very few manufacturers

who made any attempt to label their goods. The majority of terry towels tested were fast to both sunlight and laundering.

In the case of the tea towels and toweling materials, made of cotton, linen, or mixtures of these or rayon mixtures, thread count was no reliable indication of durability, due to the variation in the size of the yarns. Towels and toweling of each fiber content varied considerably in strength. Tensile strength depended upon a combination of the fiber content of the yarns, the number of yarns to the inch, and the size and amount of twist in these yarns. Price was no indication of durability of construction or strength, for all towels and toweling materials, when arranged according to price, showed wide ranges in both thread count and tensile strength. About one-fourth of the materials tested were not fast to light, but most of them were fast to laundering. Towels of cotton absorbed the greatest amount of water, but those of linen absorbed moisture more rapidly and dried much faster than the others. It made very little difference in serviceability whether the towels were purchased ready-made or as the toweling; the latter showed a greater tendency to be colorfast, but was slightly less absorbent in some cases. Flour sacking, which ranked above the average in all tests except those for tensile strength and colorfastness, proved to be a very satisfactory type of towel for the money expended.

MISCELLANEOUS

Research and farming: Sixty-fourth Annual Report of [North Carolina Station, 1941], L. D. BAYER (*North Carolina Sta. Rpt. 1941, pp. 83, figs. 33*).¹

Fifty-fifth Annual Report [of Vermont Station, 1942], J. L. HILLS (*Vermont Sta. Bul. 495 (1942), pp. 37, figs. 2*).¹

¹ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Georgia Coastal Plain Station.—G. H. King has been appointed director.

Illinois University and Station.—Dr. James M. Brannon, assistant professor and assistant chief in dairy bacteriology since 1922, died January 21 at the age of 60 years. A native of Indiana, Dr. Brannon was graduated from the University of North Dakota in 1907, subsequently receiving the M. A. degree from the University of Wisconsin in 1914 and the Ph. D. degree from Cornell University in 1920. He had taught botany, zoology, and plant physiology in the Universities of North Dakota, Wisconsin, and Cornell and had served with the North Dakota geological and biological surveys.

Indiana Station.—Dr. H. Rex Thomas, associate pathologist and engaged on problems connected with tomato diseases, is now in military service. Dr. Forrest W. Quackenbush has been appointed head of the department of agricultural chemistry. Dr. D. M. Doty, acting head of this department since the resignation of Dr. H. R. Kraybill in 1942, has been appointed assistant chief.

Maine Station.—Dr. D. S. Fink has resigned as associate agronomist, effective February 28, to accept a position in Cornell University.

Michigan College and Station.—Eben Mumford, head of the department of sociology from 1924 until his retirement in 1938, died October 17, 1942. He was a graduate of Buchtel College and received the Ph. D. degree for work in sociology at the University of Chicago. He came to Michigan in 1912, serving on its extension staff for 12 years.

H. H. Musselman, head of the department of agricultural engineering, has retired.

Nebraska University and Station.—Following the induction into military service of the county agent of Cherry County, E. M. Brouse has been put in charge of the extension program in that county but will also continue as superintendent of the substation at Valentine. Dr. Arthur W. Peterson, assistant professor and assistant in rural economics, has resigned to become associate agricultural economist in the Washington Station vice Alden E. Orr, resigned. Glenn Klingman, instructor and assistant in agronomy, has joined the armed forces.

New Mexico College and Station.—Marvin Koger has been appointed assistant animal husbandman and instructor in animal husbandry.

Utah College and Station.—Dr. Charles W. Riggs has been appointed to the veterinary staff vice Dr. Wayne Binns, who has been granted military leave.

Washington College and Station.—Dr. J. G. Harrar, plant pathologist and head of the division of plant pathology, has accepted a position with the Rockefeller Foundation as director of a new research and demonstration agency, with headquarters in México, D. F. Herman Fallscheer, assistant chemist at the Tree Fruit Branch Station, has resigned to accept a position with the U. S. Food and Drug Administration. Dr. J. C. Knott, associate dairy husbandman, has been appointed director of the college agricultural extension service vice F. E. Balmer and has been succeeded by Dr. A. A. Spielman, field agent in dairying at the University of Kentucky. Carl N. Berryman has been appointed assistant in agricultural economics vice W. W. Rufener, resigned to become asso-

ciate agricultural economist in the U. S. D. A. Agricultural Marketing Administration.

Wyoming University and Station.—John F. Cykler, instructor and assistant in agricultural engineering, has been granted leave of absence for naval service.

Inter-American Institute of Agricultural Sciences.—According to a recent article in *Agriculture in the Americas*, a site for this institute has been selected on the outskirts of Turrialba, a town in the interior of Costa Rica approximately midway between the national capital of San José and the principal port of Puerto Limón. The tract chosen for the main buildings and campus consists of 1,235 acres adjoining the U. S. D. A. Costa Rica Rubber Experiment Station. Most of the land has an elevation of about 2,000 ft., but wet lowland areas are included. The soils of the region are volcanic, temperatures average in the middle 70's, rainfall amounts to around 110 in. a year, and the humidity is high. The site is regarded as suitable for experimental cultivation of practically all tropical crops, for experimental work on livestock and dairying under tropical conditions, for study of tropical reforestation and erosion control problems, and for investigation of drainage practices. Nearby areas are well suited for the development of tropical crops not adapted to the lowlands.

The institute is to be managed by a corporation, directors of which will be the members of the Pan-American Union Governing Board, which consists of the United States Secretary of State and the diplomatic representatives in Washington of all the Latin-American republics. Projects will be recommended by a technical advisory committee composed of a member from each of the countries participating. At the outset, the organization will be financed largely by the United States, but it is expected that the other countries will join in the financing later under a convention to be signed.

The institute is conceived as a combination school of agriculture and agricultural research center, the facilities of which will be used by all of the American republics. Its objectives, as generally agreed upon by agricultural leaders of the hemisphere, are to provide a place for research on tropical agriculture under favorable conditions, to furnish facilities for training scientific personnel grounded in tropical agricultural problems, to develop mutual understanding among agricultural students of the Americas, to serve as a center for cooperative research projects, and to strengthen cultural relations among the American republics.

Plans for the institute contemplate utilization of research facilities offered by the governments of several Latin American republics as well as those of Costa Rica. Among the organizations whose facilities have been offered are the experiment stations of Puerto de Diaz (in Salta) and Loreto (in Misiones), Argentina, situated in the subtropical region of the country; the station located at Chulumani near La Paz and the farms of Trinidad and of Palermo in Santa Cruz, Bolivia; the Agronomical Institute in Belém State of Pará, Brazil; the experiment station at Palmira, Colombia; the experimental fields situated in the region between the capital and Santa Ana in the large region of Tapachula, State of Chiapas, Mexico; the experiment station at Tingo María, Peru; the Agricultural Experiment Station at Santiago de las Vegas, near Habana, Cuba; and the Institute of Tropical Agriculture at Mayaguez, Puerto Rico.

As previously announced the director of the institute is Dr. Earl N. Bressman, who is expected to operate from Washington, D. C., with a small administrative staff. José L. Colom, chief of the division of agricultural cooperation of the Pan American Union, has been appointed secretary of the organization; Rex A. Pixley, business manager of the institute, and Robert A. Nichols, agriculturist in charge of field operations.

EXPERIMENT STATION RECORD

VOL. 88

MAY 1943

No. 5

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Natural and synthetic high polymers: A textbook and reference book for chemists and biologists, K. H. MEYER, trans. by L. E. R. PICKEN (*New York*): *Interscience Pubs. Inc.*, 1942, pp. XVIII+690, figs. [182].—"During the last 10 yr. . . a branch of chemistry [that of the more highly polymerized natural organic compounds] has been developing which is destined to provide biology with much more than methods. . . ."

"The common meeting ground of chemists and biologists in high-polymer chemistry is that of morphology. Since the day when, as a result of the development of X-ray analysis, chemical formulas ceased to be symbols on paper and became models in three dimensions, the chemist has become more and more accustomed to think in terms of what may be called morphological chemistry. To the biologist, who observes that both shapes and properties of cells and cell components reflect their molecular organization, it seems likely that morphological chemistry may prove to be the chemistry of morphology. It is for him now to consider biological structure and organization in their high-polymer guise and to formulate for himself the questions which high-polymer chemistry will go far toward answering."

A short introduction presents a definition and classification of high polymers and discusses homologous polymeric series and mixtures of polymeric homologues, molecule and molecular weight, and the morphological approach to the chemistry of high polymers. Section A, the study of high polymers, takes up investigation in solution and the determination of molecular shape and arrangement in the solid state. Section B deals with inorganic high polymers; section C with high-polymeric hydrocarbons and their derivatives; section D treats of polymeric ethers, esters, sulfides, etc.; section E of cellulose and its derivatives; section F of substances related to or associated with cellulose; section G of starch and related carbohydrates; section H of the proteins; section I of the properties of high polymers in solution; section K of films, foils, and membranes; and section L of direct optical methods for the study of submicroscopic fine-structure (ultraviolet microscopy and the electron microscope), micellar theory and chain-molecule theory, and indirect methods for determining the molecular fine-structure of living substance. A table for finding the specific viscosity K and the limiting viscosity of cellulose, cellulose esters and ethers, and rubber from the relative viscosity is included as an appendix. An author index and a subject index are added.

Industrial microbiology, S. C. PRESCOTT and C. G. DUNN (*New York and London: McGraw-Hill Book Co., 1940, pp. X+541, figs. 60*).—This work is intended as a textbook for advanced students or for reference use. The assumption is made, therefore, that the student or reader will already have had somewhat extensive training in biology and general bacteriology and at least the fundamentals of organic chemistry and biochemistry. The field of applications covered is purely industrial, discussion of the manufacture of sera, vaccines, and other therapeutic agents being omitted, as is also reference to the production of cultures of nitrogen-fixing bacteria and of butter- and cream-ripening organisms. Special attention has been given (1) to a broad treatment of those large-scale fermentations in which the end products are of themselves industrially or potentially important, and (2) to consideration of others that are of special significance because of the modifications of the quality of substrate materials that they produce, as in some aspects of food technology. Following a single chapter of introduction, the book consists of four parts of the titles and contents respectively indicated. Part 1, the yeasts—a study of their activities and industrial applications, deals with the yeasts; the production of industrial alcohol by fermentation; facts and theories concerning the mechanism of the ethyl alcohol fermentation; brewing; wine; the distilling industries; yeast—its manufacture, vitamins, and uses; the glycerol fermentation; and fat production by yeasts and yeastlike micro-organisms. Part 2, the bacteria—a study of their activities and industrial applications, consists of chapters on the bacteria, the acetone-butanol fermentation, the acetone-ethanol fermentation, the butyl alcohol-isopropyl alcohol fermentation, the acetic acid bacteria and some of their biochemical activities, the production of lactic acid by fermentation, sauerkraut, pickles, silage, some lactic acid bacteria and some fermented milk products, cheese, the propionic acid fermentation, and some minor fermentations with industrial implications. Part 3, the molds—a study of their activities and industrial applications, takes up the molds, the citric acid fermentation, the gluconic acid fermentation, the production of lactic acid by molds, the gallic acid fermentation, the kojic acid fermentation, the fumaric acid fermentation, mannitol production by molds, mold enzyme preparations—uses and products, the production of fat by molds, and some minor chemical activities of the lower fungi. Part 4, specialized activities of the molds, yeasts, and bacteria, is made up of two chapters—textile microbiology and the microbiology of wood. Two appendixes—A, detergency, disinfection, and sterilization, and B, the treatment and disposal of industrial microbiological wastes—and a subject index conclude the volume.

Text-book of comparative histology, E. C. COLE (*Philadelphia: Blakiston Co., [1941], pp. VII+396, figs. 297*).—The author finds the comparative viewpoint, though of proved value in gross anatomy, to have been somewhat neglected in the study of tissues. A student handbook rather than a reference book is intended. Photomicrographs have been freely used so that the student may become familiar with tissues as they appear in actual histological preparations. A short chapter on the nature, use, and care of the microscope is included. The treatment of the microscope is necessarily incomplete, but the student is referred to *The Use of the Microscope*, by Belling (E. S. R., 67, p. 201), to other textbooks, and to work ancillary to that of Belling (E. S. R., 74, p. 767). The processes of fixing, washing, denhydrating, imbedding and cutting, staining, and mounting of sections, as well as temporary mount procedures, insofar as they apply to animal histology, are dealt with in working detail, and specific examples for practice work are described. The four sections of the book are made up of the chapters respectively noted: Introductory section—the problems of histology, the nature of cells, and the origin of tissues; the structure and functions of

tissues—epithelial tissues, vascular tissues, connective tissues, supporting tissues, contractile tissues, and nerve tissue; organs as tissue complexes—the blood-vascular system, the lymphatic system, the integument, the digestive system, the respiratory system, the excretory system, the reproductive system, the endocrine system, the nervous system, and the sense organs; and instruments and methods—the use and care of the microscope, methods of recording data, and histological technic.

[**Chemical investigations by the Georgia Station**] (*Georgia Sta. Rpt. 1942*, pp. 66-68, 76-77, 86-89).—Data are given on the protein and mineral content of lespedeza and Bermuda grass, together with work on peanut proteins, utilization of peanuts, sorghum sirup, and the effect of handling peanuts in the field on the quality of the nuts and oil (coop. Ga. Coastal Plain Expt. Sta.).

[**Chemical investigations by the Kansas Station**] (*Kansas Sta. Bion. Rpt. 1941-42*, pp. 27, 28-30, 34-35).—Subjects studied included chemical factors influencing the quality of wheat and flour, worked on by E. G. Bayfield and A. L. Clapp; tempering factors that affect the quantity and quality of wheat flour, by R. O. Pence and J. E. Anderson; factors which influence the colloidal properties of dough, by C. O. Swanson and E. B. Working; the influence of some factors affecting the physical properties of wheat, by Swanson; conditioning requirements of wheat and their influence upon milling and baking, by Pence and W. F. Keller; the effect of ICl_3 , ethylene gas, and Cl on the quality of Kansas wheat, by Bayfield et al.; and industrial utilization of sorghum grains, by H. N. Barham and J. W. Greene.

[**Chemical investigations by the Oregon Station**] (*Oregon Sta. Bul. 401 (1941)*, pp. 38, 71-72).—Factors affecting the stability of erythrosine dye in cherry tissue; razor clam qualities as affected by canning, freezing, and storage procedures; and salmon cheek quality as affected by freezing and storage are reported upon briefly.

[**Chemical investigations by the Puerto Rico Station**] (*Puerto Rico Sta. Rpt. 1941*, pp. 5-7, 7-9, 10-11, 23).—The processing of vanilla beans, by A. G. Kevorkian and F. E. Arana, and the chemical changes involved in flavor development, by A. K. Balls and Arana, are reported upon, together with agronomic and processing studies with essential oils from lemon grass and coffee flowers, by A. R. Villamil and N. G. Arrillaga, and chemical studies in the distillation of bay oil, by Arrillaga and M. A. Jones; drug plant chemistry of *Cinchona*, digitalis, and jimsonweed, by H. T. Love; and analyses of lemon-grass distillation residues, by J. O. Carrero.

The chemistry and toxicity of selenium compounds, with special reference to the selenium problem, E. P. PAINTER. (N. Dak. Expt. Sta. and Univ. Minn.). (*Chem. Rev.*, 28 (1941), No. 2, pp. 179-213).—Under the head of the selenium problem in agriculture, the author briefly traces the history of observed selenium poisoning from the observations of Marco Polo in China to the present time and discusses the toxicity of various selenium compounds both as they occur in nature and as feed or injected in laboratory experiments, selenium in soils and in plants, and the relation between selenium and sulfur in plants. The second main division of the review is devoted to methods for the determination of selenium, the third to organic compounds of selenium, and the fourth to the properties of selenium in plants and their relation to known compounds of selenium and of sulfur.

The mucilage from Indian wheat, *Plantago fastigiata*, E. ANDERSON, L. A. GILLETTE, and M. G. SEELEY. (Univ. Ariz.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 569-574).—A mucilage isolated from the seed of Indianwheat, *P. fastigiata*, in a yield of approximately 19 percent of the weight of the seed was

found to be a mixture of acids varying in composition approximately from that of 8 to that of 17 pentosan molecules, combined with 1 molecule of *d*-galacturonic acid. The mixture consisted of salts of *d*-galacturonic acid, combined by a glycosidic union from its aldehyde group with a chain of a few molecules of *l*-arabinose, this being attached to a longer chain of molecules of *d*-xylose, and the *d*-xylose apparently attached to a small proportion of some material which remains as an insoluble precipitate when the mucilage is hydrolyzed. The *P. fastigiata* mucilage was found very similar in composition and properties to the mucilage isolated from *P. psyllium*.

The chemical nature of actinomycin, an antimicrobial substance produced by *Actinomyces antibioticus*, S. A. WAKSMAN and M. TISHLER. (N. J. Expt. Stas. et al.). (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 519-528, figs. 3).—A red pigment, designated as actinomycin A, has been isolated in a pure crystalline form from a soil organism, *A. antibioticus*. Out of 250 strains of actinomycetes tested, no other organism appeared to produce this pigment. Actinomycin was found to contain 59 percent carbon, 6.8 hydrogen, 13.35 nitrogen, and 20.8 percent oxygen. It appeared to be a polycyclic nitrogen compound, was optically active, had a molecular weight of about 800, exhibited characteristic absorption both in the visible and ultraviolet regions, and seemed to have a reversible oxidation-reduction system, apparently of a quinone type. Actinomycin was found an active bacteriostatic and bactericidal (as well as fungistatic and fungicidal) agent, the degree of activity varying with the nature of the organism. It was active in concentrations of 1:100,000,000 against certain gram-positive bacteria, and was found highly toxic to animals.

The threonine, serine, cystine, and methionine content of peanut proteins, W. L. BROWN. (Ga. Expt. Sta.) (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 299-301).—Arachin and conarachin were found to contain, respectively, 2.56 and 2.02 percent of threonine, 5.20 and 4.99 of serine, 1.51 and 2.92 of cystine, and 0.67 and 2.12 percent of methionine.

Does hydroxyglutamic acid occur in milk proteins? B. H. NICOLET and L. A. SHINN. (U. S. D. A.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 139-146).—Using a reaction with a periodate in alkaline solutions (15 cc. of saturated potassium carbonate solution, from 1 to 2 cc. of 0.5-M periodic acid, and an aliquot of the protein hydrolyzate equivalent to from 100 to 200 mg. of the protein in not more than 5 cc.), by which α -amino- β -hydroxy acids are broken up rapidly and quantitatively to yield two aldehydes and ammonia, the authors obtained evidence strongly indicating the entire absence of hydroxyglutamic acids from the hydrolyzates of casein, lactalbumin, and lactoglobulin. The ammonia evolved in this reaction was all accounted for as threonine and serine in molecular ratios almost exactly integral. In casein this threonine : serine molecular ratio was very close to 3:5 (0.598), in lactalbumin 1:1 (0.973), and lactoglobulin 4:3 (1.335). To show that hydroxyglutamic acid would not be entirely destroyed in protein hydrolysis, if originally present, samples of the acid were added to casein before hydrolysis, and 56 and 70 percent, respectively, could be recovered from two hydrolyses. Other evidence supporting the authors' contention that either no hydroxyglutamic acid or very little is present in the milk proteins was also obtained.

The modification of cupric chloride crystallization patterns by traces of proteins, D. L. and C. T. MORRIS (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 515-520, pl. 1).—Minute quantities of proteins can greatly modify the cupric chloride crystallization patterns produced by polysaccharides and similar substances. This modification is apparently not due entirely to surface tension

effects. The protein effect seems to depend upon the total amount of protein present rather than on the proportion of protein to polysaccharide.

The specificity of the pattern so far described appears to be due to the polysaccharides, whereas the action of the proteins is entirely nonspecific.

The synthesis of *l*-S-(β -amino- β -carboxyethyl)homocysteine and the replacement by it of cystine in the diet, V. DU VIGNEAUD, G. B. BROWN, and J. P. CHANDLER. (Cornell Univ.). (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 59-64, figs. 2).—The new amino acid was synthesized by treating *l*-homocysteine with *l*- α -amino- β -chloropropionic acid hydrochloride under conditions described in working detail. N,N'-Dibenzoyl-*l*-S-(β -amino- β -carboxyethyl) homocysteine was also prepared.

It was shown that the amino-acid-thio ether can serve in lieu of cystine in the diet for the support of growth of animals. The possible significance of this finding to the question of the mechanism of the conversion of methionine and homocystine to cysteine is discussed.

The formation of lanthionine on treatment of insulin with dilute alkali, V. DU VIGNEAUD, G. B. BROWN, and R. W. BONSNES. (Cornell Univ.). (*Jour. Biol. Chem.* 141 (1941), No. 2, pp. 707-708).—After destruction of much of the cystine either by sodium carbonate (2-percent solution) or by sodium hydroxide solution (N/30), samples of insulin yielded, by acid hydrolysis, about 1 percent of the weight of the insulin as lanthionine. This yield, containing about 5.5 percent of the total sulfur, is, with reference to percentage of the total sulfur content, similar to that obtained from wool.

The preparation of histidine by means of 3,4-dichlorobenzenesulfonic acid, H. B. VICKERY. (Conn. [New Haven] Expt. Sta.). (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 77-87).—The author showed that when a liberal excess of 3,4-dichlorobenzenesulfonic acid is added to a decolorized hydrochloric acid hydrolyzate of crude hemoglobin at pH 1.2 to 1.6, histidine slowly separates in the cold as the relatively insoluble di-3,4-dichlorobenzenesulfonate. The histidine salt is at times accompanied by a considerable quantity of impure leucine mono-3,4-dichlorobenzenesulfonate, but the mixture can readily be separated by recrystallizing and taking advantage of the marked capacity of the impure leucine salt to form a supersaturated solution. Most of this can be removed from the crystals of histidine salt by decantation under the correct conditions; the histidine salt is then readily purified by recrystallization. Histidine is recovered in satisfactorily pure form, either as free base or as the monohydrochloride, after removal of the sulfonic acid as its insoluble barium salt. The yields depend upon the purity of the starting material with respect to its content of hemoglobin; from fairly pure preparations of red blood cells, the equivalent of over 6 percent of histidine has been obtained.

Aromatic sulfonic acids as reagents for amino acids: The preparation of *l*-serine, *l*-alanine, *l*-phenylalanine, and *l*-leucine from protein hydrolyzates, W. H. STEIN, S. MOORE, G. STAMM, C.-Y. CHOU, and M. BERGMAN (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 121-129).—On the basis of the solubility products of their amino acid salts, several sulfonic acids derived from diphenylamine, anthraquinone, and azobenzene were found to be of potential value for the isolation, purification, and determination of amino acids. The utilization of sulfonic acids for the preparation of amino acids is exemplified by procedures for the isolation of *l*-phenylalanine and *l*-leucine from hydrolyzates of hemoglobin and of *l*-serine and *l*-alanine from hydrolyzates of silk fibroin.

Threonine deficiency in hydrolyzates of zein prepared by autoclaving, R. BORCHERS, J. R. TOTTER, and C. P. BERG (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 697-704, fig. 1).—Feeding tests showed that sulfuric acid hydrolyzates of zein

prepared under a reflux or under relatively mild conditions in the autoclave possess about the same capacity as does zein to support growth when incorporated in diets supplemented with lysine, tryptophan, histidine, and cystine. More drastic autoclave treatment produced hydrolyzates which did not support growth under similar conditions unless threonine was added. Still more severe autoclaving induced deficiencies which could not be met by threonine supplementation alone. Threonine determinations in several hydrolyzates of zein and casein according to either method showed that threonine is destroyed as the conditions of hydrolysis become more severe. Pure threonine also suffered marked destruction when autoclaved with sulfuric acid under conditions which destroy it in the hydrolysis of zein.

The effect of conditions of hydrolysis and of prolonged heating upon the optical rotation of sulfuric acid hydrolysates of zein, R. BORCHERS and C. P. BERG (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 693-696, fig. 1).—During the course of the hydrolysis of zein with aqueous sulfuric acid (14 to 33 percent by volume), either under a reflux or in the autoclave at 120°-180°, no appreciable racemization or destruction of amino acids occurred. Prolonging the refluxing to from 36 to 60 hr. had little or no effect, but autoclaving longer than necessary for hydrolysis induced both racemization and destruction, more markedly so at the higher temperatures. Concentrations of sulfuric acid as low as 8 percent by volume are apparently not suitable for the complete and uncomplicated hydrolysis of zein.

The lability toward alkali of serine and threonine in proteins, and some of its consequences, B. H. NICOLET, L. A. SHINN, and L. J. SAIDEL (U. S. D. A.). (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 609-613).—The authors have demonstrated a reaction by which serine and threonine, when in protein combination, are destroyed in alkaline solution at a rate which is disproportionately greater than any corresponding effect on free serine or threonine. The liberation of additional ammonia, beyond that usually described as "amide ammonia" in the direct hydrolysis, was shown to be quantitatively correlated with the destruction of hydroxyamino acids. The authors believe that the reaction in question involves (e. g., for serine) the formation of dehydroalanyl units in the only partially hydrolyzed protein molecule.

A synthesis of the aspartic acid analogue of glutathione (asparthione), G. L. MILLER, O. K. BEHRENS, and V. DU VIGNEAUD (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 411-416).—The tripeptide β -aspartylcysteinylglycine, to which the name asparthione is assigned (differing from glutathione only in that it contains aspartic acid bound through the β -carboxyl group instead of glutamic acid bound through the γ -carboxyl group), has been synthesized. The acid chloride of α -benzyl-N-carbobenzoxyaspartic acid was condensed with S-benzylcysteinylglycine methyl ester. The resulting ester was saponified, yielding N-carbobenzoxy- β -aspartyl-S-benzylcysteinylglycine. This product was then reduced with sodium in liquid ammonia, and the resulting asparthione was isolated through the mercury and copper salts and finally as the free tripeptide.

Influence of some dietary factors on the development of rancidity in the fat of the white rat, A. OVERMAN. (Oreg. State Col.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 441-444).—Rats were fed a synthetic diet, one group receiving no supplement, a second group 1 mg. of ascorbic acid daily, and a third group 1 mg. of hydroquinone daily. The results of rancidity tests on fats from each series indicated that the differences in resistance to rancidity are due partly to thinness or fatness of the animal and partly to the diet. Ascorbic acid feeding, together with a low percentage of gain in weight, resulted in a significant increase in resistance of the fat to rancidity.

The synthesis of some methylated fatty acids, A. K. SCHNEIDER and M. A. SPIELMAN. (Univ. Wis.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 345-354).—By methods of the use of which examples are given in working detail, α -methyl acids with even-numbered fundamental carbon chains from α -methylstearic to α -methylhexacosanoic acid were synthesized. 10-Methyldocosanoic, 10 methyl-tetracosanoic, and 10-methylhexacosanoic acids were also made. The corresponding amides were prepared as derivatives.

[**Salicylic acid from naphthalene by bacterial oxidation**] (*Pennsylvania Sta. Bul.* 429 (1942), p. 32).—Conversion of naphthalene to salicylic acid by the action of a *Pseudomonas* species and improvement of the yield given by this process are briefly noted by R. W. Stone.

The acid-splitting reaction of acetoacetic acid and the enzymatic formation of acetic acid from acetoacetic acid, A. L. LEHNINGER. (Univ. Wis.). (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 147-157).—Acetic acid was the only product obtained when acetoacetic acid was hydrolyzed by strong bases. No other catalyst could be found for the reaction. Rabbit muscle mince formed small quantities of acetic acid from acetoacetic acid, when incubated at 38° for 2 hr. Pure cultures of *Escherichia coli* formed large quantities of acetic acid anaerobically from acetoacetic acid. The catalytic system involved in the muscle mince and the bacteria was thermolabile and possessed other enzyme properties.

Fixation of carbon dioxide by pigeon liver in the dissimilation of pyruvic acid, H. G. WOOD, C. H. WEBKMAN, A. HEMINGWAY, and A. O. NIER. (Iowa Expt. Sta. and Univ. Minn.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 31-45).—The dissimilation of pyruvate by pigeon liver was accompanied by fixation of carbon dioxide. By use of $C^{13}O_2$, the fixed carbon was shown to be exclusively in the carboxyl groups of the 4-carbon dicarboxylic acids (malate, fumarate, and succinate), the carboxyl adjacent to the carbonyl of α -ketoglutarate, and the carboxyl of lactate. Aerobically, in the presence of malonate, succinate, which contains little or no fixed carbon, is formed. The theory that the 4-carbon dicarboxylic acids are formed by two mechanisms is proposed, one being reductive through the carbon fixation reaction, the other an oxidative cycle which does not involve citric acid. The scheme accounts for the observed positions of the fixed carbon and the aerobic formation in the presence of malonate of succinate not containing fixed carbon. Possible mechanisms of fixation of carbon in lactate are considered.

The occurrence of d-amino acids in gramicidin and tyrocidine, F. LIPMANN, R. D. HORTCHKISS, and R. J. DUBOS (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 163-169, fig. 1).—Enzymatic assay with d-amino acid oxidase indicated that 45 percent of the α -amino acids of gramicidin hydrolyzates have the d configuration. Tyrocidine appeared to contain d-amino acids amounting to 20 percent of its α -amino acids.

The fermentative decomposition of purines by *Clostridium aciduri* and *Clostridium cylindrosporum*, H. A. BARKER and J. V. BECK. (Univ. Calif.). (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 3-27, figs. 3).—The uric acid-fermenting anaerobic bacteria *C. aciduri* and *C. cylindrosporum* were found to decompose only a very few organic compounds, all of which with the exception of glycine, are purine derivatives. Uric acid, xanthine, and guanine were broken down rapidly and completely by cell suspensions and growing cultures, while hypoxanthine and some other compounds liberated their nitrogen slowly and generally incompletely. The products of anaerobic purine decomposition by *C. aciduri* were ammonia, carbon dioxide, and acetic acid, while *C. cylindrosporum* forms in addition small amounts of glycine. Both organisms

decomposed glycine when a fermentable purine was simultaneously available but not otherwise. Glycine was activated as a strong hydrogen donor and appeared to be an intermediate in either purine break-down or carbon dioxide reduction. The reactions produced by these anaerobic bacteria appeared to be oxidations in which carbon dioxide acts as the ultimate hydrogen acceptor and is reduced to acetic acid.

The possibility of using these bacteria for the quantitative and qualitative determinations of uric acid, guanine, and xanthine is pointed out.

The oxidation of phospholipids in the presence of ascorbic acid and carcinogenic chemicals, H. F. DEUTSCH, B. E. KLINE, and H. P. RUSCH. (Univ. Wis.). (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 529-538, figs. 3).—The oxidation of phospholipides in the presence of ascorbic acid was measured by manometric determinations of oxygen consumption, and the effects of carcinogenic compounds, hydroquinone, and copper on this system were observed. Phospholipide oxidation was catalyzed by the presence of ascorbic acid at pH 4. The catalyzed phospholipide oxidation was inhibited by the presence of carcinogenic compounds and hydroquinone.

Polyuronide hemicelluloses isolated from sap-wood and compression wood of white pine, *Pinus strobus*, L., E. ANDERSON, J. KESSELMAN, and E. C. BENNETT. (Univ. Ariz.). (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 563-568).—From wood of *P. strobus* cut in eastern Massachusetts during the winter and separated into compression wood and sapwood, pectic material and polyuronide hemicelluloses were isolated both before and after chlorination of the wood. Larger amounts of the hemicelluloses and more mannan free of a uronic acid were obtained from the compression wood than from the normal sapwood, but otherwise the products isolated from the two woods were very similar. Analysis of the wood after the final extractions showed mannan to be still present. The pectic material appeared to be the same as that obtained from hardwoods and to be a pectinic acid. The hemicelluloses isolated from white pine were found to form a complex mixture, apparently of two types, one a mannan free of a uronic acid, the other a monomethyluronic acid combined with a chain of five or six xylan units, which in turn is combined with a series of mannan units. These mannan units appeared to be split off readily. Some fractions which even after purification gave as low as 1 percent carbon dioxide and a correspondingly low percentage of pentosan were obtained. These were apparently combined with larger proportions of mannan.

"While no definite conclusion can be drawn as to the size of the hemicellulose molecule in the cell wall, it must be much larger than those finally isolated. One suggestion is that the carboxyl group of one hemicellulose forms an ester linkage with a hydroxyl group on another hemicellulose, thus leading to the formation of a long branching chain. The outer ends of these chains might be combined by glycosidic union either with mannan or with lignin or other material. If plant materials containing such large molecules were treated with sodium hydroxide solution, the ester linkages would be broken and the smaller molecules would be dissolved out as sodium salts. Treatment of these soluble salts with an acid would lead to more or less hydrolysis of the glycosidic linkages, thus liberating mannan and other materials at the outer end of the chain."

Coenzymes for glyoxalase, O. K. BEHRENS. (Cornell Univ.). (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 503-508, fig. 1).—Both isoglutathione (α -glutamylcysteinylglycine) and asparthione (β -aspartylcysteinylglycine) have been demonstrated to be capable of acting in lieu of glutathione as coenzymes for the action of glyoxalase in transforming methylglyoxal to lactic acid. The pH

optimum for the enzyme action proved to be broad and to lie in a similar range for all three substances. Asparthione ($K_s=3.7\times10^{-3}$) was somewhat less effective than glutathione (7.4×10^{-4}), and isoglutathione (1.23×10^{-3}) was considerably less effective. In the presence of optimal amounts of any two of the coenzymes the rate of enzyme action was intermediate between that found with the coenzymes used alone. The extrapolated maximum velocities were approximately the same with all three coenzymes. Cysteinylglycine was without effect as a coenzyme.

The ultraviolet absorption spectrum of crystalline ribonuclease, F. M. UBER and V. R. ELLS. (Univ. Mo.). (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 229-230, fig. 1).—The absorption curve, measured with a photometer and tungsten steel spark source, is shown. The molecular extinction coefficient, ϵ , defined by the equation $\epsilon=(1/cd) \log_{10} (I_0/I)$ where c is the molar concentration and d is the length of the absorbing solution in centimeter, had a maximum value of 11,540 near 280 $m\mu$ and a minimum of 6,160 at 252 $m\mu$. Almost identical values were obtained for solutions in phosphate buffer at pH 4.5 and in borate buffer at pH 2.5.

A figure of 9 to 10 tyrosine residues in the ribonuclease molecule could be calculated from the adsorption spectrum data, whereas the presence of 12 was indicated by chemical means.

A photochemical yield for the inactivation of crystalline trypsin, F. M. UBER and A. D. McLAREN. (Univ. Mo.). (*Jour. Biol. Chem.*, 141 (1941), No. 1, pp. 231-237, fig. 1).—The ultraviolet absorption spectrum of crystalline trypsin was found to have a maximum ($\epsilon=50,000$) near 280 $m\mu$. The number of trypsin molecules inactivated per quantum of radiation adsorbed at 2,537 and 2,804 a. u. were 0.017 and 0.016, respectively, inactivation being defined as the loss of ability to liberate carboxyl groups in α -benzoyl-L-arginineamide hydrochloride.

[Reports of referees and associate referees on analytical methods] (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 3, pp. 551-745, figs. 5).—The following comprise a part of the reports on analytical methods contributed from the State and Federal institutions respectively noted, from State control and regulatory laboratories, etc., presented at the 1941 meeting of the Association of Official Agricultural Chemists; Plants, by E. J. Miller (p. 551), zinc and iron in plants, by H. Cowling and E. J. Benne (pp. 555-567), copper and cobalt in plants, by L. I. Butler and H. O. Allen (pp. 567-573), and chlorophyll and carotene in plant tissue, by E. J. Benne (pp. 573-591) (all Mich. Expt. Sta.); iodine and boron, by R. H. Hageman, J. S. McHargue, and W. S. Hodgkiss (pp. 552-555) (Ky. Sta.); water, brine, and salt, by A. E. Mix (pp. 591-592); dairy products, by G. G. Frary (pp. 592-594); cheese, by I. D. Garard (pp. 594-601) (Rutgers Univ.); lactic acid, by F. Hillig (p. 602); lactose in milk, by E. R. Garrison and L. D. Haigh (pp. 603-609) (Mo. Sta.); mold mycelia in butter, by J. D. Wildman (p. 609); neutralizers in dairy products, by F. Hillig (pp. 610-612); frozen desserts, by F. L. Hart (pp. 612-617); radioactivity, by A. Wolf (p. 618); cereals, by V. E. Munsey (pp. 618-621); starch in raw and cooked cereals, by M. P. Etheredge (pp. 621-624); chlorine in fat of flour, by D. B. Scott (pp. 624-627); carbon dioxide in self-rising flour, by R. A. Barackman (pp. 627-628); milk solids in bread, by V. E. Munsey (pp. 628-630); proteolytic activity of flour, by Q. Landis (pp. 631-634); carotenoid pigments in flour, by H. K. Parker (pp. 634-638); noodles, by E. O. Haenni (pp. 638-641); oat products, by H. P. Howells (pp. 641-644); barley and rice products, by A. D. Dickson (pp. 645-648), and moisture in self-rising flour and in pancake, waffle, and doughnut flours, by L. H. Bailey (pp. 648-649) (both U. S. D. A.); standard solutions by R. L. Vandaveer (pp. 650-653); constant boiling hydrochloric acid,

by W. H. King (pp. 653-659); standard sodium thiosulfate solutions, by G. M. Johnson (pp. 659-661); thiocyanate solutions, by E. C. Deal (pp. 661-664); sulfuric acid, by H. W. Conroy (pp. 664-667); insecticides and fungicides, by J. J. T. Graham (pp. 667-670), and fluorine compounds, by C. G. Donovan (pp. 670-673) (both U. S. D. A.); sugars and sugar products, by R. F. Jackson (pp. 674-675); the normal weight of invert sugar and a test of Vosburgh's rule, by R. F. Jackson and E. J. McDonald (pp. 675-680); honey and honeydew honey, by G. P. Walton, (pp. 681-689) (U. S. D. A.); flavors and nonalcoholic beverages, by J. B. Wilson (pp. 690-693); organic solvents in flavors, by R. D. Stanley (pp. 693-695); meat and meat products, by R. H. Kerr (pp. 696-697) (U. S. D. A.); spices and other condiments, by S. Alfend (pp. 697-700); volatile oil in spices, by J. F. Clevenger (pp. 700-701); vinegars, by A. M. Henry (pp. 702-705); mustard and mustard products, by J. T. Field (pp. 705-708); fish and other marine products, by H. D. Grigsby (pp. 709-710); total solids and ether extract in fish, by M. Tubis (pp. 710-713); volatile acids, by F. Hillig (pp. 713-714); cacao products, by W. O. Winkler (pp. 714-716); milk proteins in milk chocolate, by M. L. Offutt (pp. 716-717); lecithin in cacao products, by J. H. Bornmann (pp. 717-718); gums in food products, by F. L. Hart (pp. 718-722); soft curd cheese, by M. J. Gnagy (pp. 722-726); oils, fats, and waxes, by J. Fitelson (pp. 726-728); unsaponifiable matter, by G. Kirsten (pp. 728-733); microbiological methods, by A. C. Hunter (pp. 733-735); frozen fruits and vegetables, by H. E. Goresline (p. 736) (U. S. D. A.); nuts and nut products, by M. Ostrolenk (pp. 736-737); canned vegetables, by E. J. Cameron (pp. 738-740); and frozen egg products, by R. Schneider (pp. 740-745).

Semimicro qualitative analysis (the Barber pressure bulb method), H. H. BARBER and T. I. TAYLOR (*New York and London: Harper & Bros.*, [1942], pp. XVI+446, figs. 54).—Semimicroanalysis, as here defined, uses volumes of solutions ranging from single drops to about 1 cc. Small test tubes, pressure filter tubes, semimicro suction funnels, spot plates, glass slides, and drop-reaction papers are used to carry out the identification tests.

This textbook is divided into three parts, of which part 1, theoretical principles of qualitative analysis, comprises chapters on elementary principles, chemical reactions and equations, theories of solutions and ionization, ionic equilibrium, and precipitation and the dissolution of precipitates. Part 2, covering semimicro qualitative analysis for the detection of cations and anions, contains the three chapters semimicrotechnic, systematic analysis of the cations, and systematic analysis of the anions. Part 3 consists mainly of reference tables showing the properties and reactions of the ions and includes various appendixes. A subject index completes the book.

The determination of sodium in the presence of phosphates, A. E. SOBEL, G. KRAUS, and B. KRAMER (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 501-508).—In analyses of sera the concentration of phosphate found in some pathological samples caused high results. Removal of the phosphate by electrodialysis, followed by a determination involving oxidation by a form of the nitric perchloric acid method (E. S. R., 75, p. 153) with the additional use of sulfuric acid, and separation of the sodium as the zinc uranyl acetate salt in a procedure similar to that of Butler and Tuthill (E. S. R., 67, p. 7), gave accurate results.

Microdetermination of calcium by precipitation as picrolonate and estimation of the precipitated carbon by manometric combustion, D. D. VAN SLYKE and F. J. KREYSA (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 765-776, fig. 1).—A micromethod for calcium is described in which the calcium is precipitated as picrolonate and the precipitate, containing 20 atoms of carbon

to 1 of calcium, is estimated from the carbon, which is determined by a rapid manometric wet combustion method. Precipitation and combustion are done without transfer in a single centrifuge-combustion tube. The method serves for estimation of quantities of calcium smaller than can be determined accurately by the usual microprocedures based on titration of the oxalate; 0.2 mg. of calcium or 0.2 cc. of serum suffices for an analysis.

Rapid methods for determining iodine in soluble iodides and in organic compounds, G. R. CLARK and J. H. JONES (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 3, pp. 755-760).—The authors modified the method of oxidation by permanganate and titration of the resulting iodate. The manganese dioxide formed in nitric acid was more readily dissolved on adding nitrite than that produced when sulfuric acid was used in the permanganate treatment. Sulfamic acid was found to react with the nitrite more readily than did urea and was, therefore, preferred as a reagent for removing excess nitrite. Separate procedures for soluble inorganic iodides in the presence of traces of chlorides or bromides, for such soluble iodides accompanied by large proportions of chlorides and bromides, and for organic compounds (1) nonvolatile and acid soluble, (2) nonvolatile, insoluble in acids but soluble in bases, and (3) insoluble or volatile organic compounds are described.

Effect of nitrates on determination of protein nitrogen by Kjeldahl method, E. I. WHITEHEAD and O. E. OLSON. (S. Dak. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 3, pp. 769-772).—For routine determinations of crude protein, where checks between duplicate titrations of 0.3 cc. are expected and with N/14 hydrochloric acid and N/14 sodium hydroxide as standard solutions, a concentration of nitrate nitrogen in excess of 0.06 percent (0.433 percent potassium nitrate) will result in a significant error. When hays and forages are known to contain considerable nitrate nitrogen, some modified method should be used for the determination of crude protein. This also applies to greenhouse work, as many plants grown under glass have very high concentrations of nitrate nitrogen. Significant errors in the Kjeldahl determination may result when the samples contain nitrates.

The determination of hydroxylysine in proteins, D. D. VAN SLYKE, A. HILLER, and D. A. MACFADYEN (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 681-705, figs. 2).—Hydroxylysine in protein hydrolysates has been determined by precipitating it with the other diamino acids as phosphotungstate and determining the ammonia evolved from the $\cdot\text{CH}(\text{OH})\cdot\text{CH}(\text{NH}_2)\cdot$ group of the hydroxylysine when the diamino acids are treated with alkaline periodate: $\text{RCH}(\text{OH})\cdot\text{CH}(\text{NH}_2)\text{R}' + \text{NaIO}_4 = \text{RCHO} + \text{R}'\text{CHO} + \text{NH}_3 + \text{NaIO}_3$. Under the conditions employed for the periodate-ammonia reaction with hydroxylysine, the other amino acids with the $\cdot\text{CH}(\text{NH}_2)\cdot\text{CH}(\text{OH})\cdot$ group, viz, serine, threonine, and β -hydroxyglutamic acid, also give quantitative yields of ammonia; no amino acid without this group has been found to yield ammonia. In the analysis of protein hydrolyzates for hydroxylysine, the other ammonia-yielding amino acids are completely separated from the hydroxylysine by recrystallization of the diamino acid phosphotungstates. If periodate reacts in a solution containing only hydroxyamino acids, the yields of ammonia are only from 80 to 90 percent of the theoretical, apparently because part of the ammonia condenses with some of the aldehyde that is formed from the rest of the hydroxyamino acid. If a sufficient excess of nonhydroxyamino acid is present, however, a quantitative yield is obtained from the hydroxy acids, presumably because the amino groups of the nonhydroxyamino acids condense with the nascent aldehyde before it can combine with the ammonia. Consequently, in analyses of hydroxylysine an adequate concentration of glycine is added in order to make the ammonia yield quantitative.

In a series of 16 proteins analyzed for hydroxylysine only 6 were found in which hydroxylysine contained over 0.1 percent of the total nitrogen, and in only gelatin and collagen did the amount approach 1 percent of the total protein nitrogen.

A colorimetric micromethod for the estimation of cystine and cysteine, B. VASSEL (*Jour. Biol. Chem.*, 140 (1941), No. 2, pp. 323-336, figs. 2).—Microcolorimetric methods for the estimation of cystine and cysteine are based upon the development of a blue color by heating cystine or cysteine or both in acid solution with *p*-aminodimethylaniline in the presence of ferric ammonium sulfate and determining the percentage absorption at 580.0 m μ by a spectrophotometer. From 0.01 to 0.20 mg. of cystine or cysteine per cubic centimeter of solution could be estimated, with an average error of ± 3 percent.

The formation of the typical blue color appeared to require a thiol group and a primary amine separated from each other by two $-\text{CH}_2-$ groups as found in cystine and cysteine. Reduced glutathione and homocystine did not react to give the blue color. However, they interfered with cystine analyses, apparently by reducing the colored compound to its leuco compound. Ascorbic acid and tyrosine exerted no such effect on the reaction, except that when the former was added after the blue color was formed, reduction of the color to the leuco compound occurred.

Gasometric determination of carboxyl groups in free amino acids, D. D. VAN SLYKE, R. T. DILLON, D. A. MACFADYEN, and P. HAMILTON (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 627-669, figs. 6).—In an analytical method for free amino acids, CO_2 from their carboxyl groups is evolved in a few minutes by reaction with ninhydrin and is measured in the Van Slyke-Neill manometric apparatus (*E. S. R.*, 69, p. 172). The same apparatus and technic serve for micro- and macroanalyses. The precision and rapidity of the method are such that it affords a convenient criterion of the analytical purity of isolated amino acids. Each of the known amino acids yielded by protein hydrolysis evolves at properly chosen pH 1 mole of CO_2 except aspartic acid and cystine, which evolve 2. Glutamic acid, unlike aspartic, evolves CO_2 from only one carboxyl group. The CO_2 -forming reaction is uniquely specific for free amino acids in that it requires the presence, in the free, unconjugated state, of both the carboxyl group and of the NH_2 or (in proline and hydroxyproline) the $\text{NH}(\text{CH}_2)$ group. Peptides as a class yield no CO_2 , or only traces, in the analysis. An exception among peptides is glutathione, in which glutamic acid is so linked that the $-\text{CH}(\text{NH}_2)\text{-COOH}$ group is free.

When combined with the Van Slyke nitrous acid method for amino nitrogen (*E. S. R.*, 26, p. 22), the ninhydrin carboxyl method serves to estimate certain amino acids in mixtures with others. In mixtures of the diamino acids, the excess of NH_2 over COOH serves to measure the lysine plus hydroxylysine. In mixtures of aspartic acid with glutamic acid, alanine, etc., the excess of determinable COOH over the NH_2 or total nitrogen serves as a measure of the aspartic acid. In protein digests carboxyl determinations indicate the amounts of free amino acids formed. Crystalline trypsin was thus shown to digest casein to peptides without liberation of free amino acids.

Chloramine-T as a decarboxylating reagent gives results similar to those from ninhydrin, but less sharply quantitative.

Determination of free amino acids by titration of the carbon dioxide formed in the reaction with ninhydrin, D. D. VAN SLYKE, D. A. MACFADYEN, and P. HAMILTON (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 671-680, fig. 1).—Using a primary reaction the same as that employed in the method noted in the preceding abstract, the authors developed a procedure in which the only special apparatus required consists of two 25-cc. Erlenmeyer flasks connected by a

U-tube. The reaction occurs in one flask; the CO_2 then distills in vacuo during 2 to 3 min. into standard barium hydroxide in the other flask, where the excess hydroxide is titrated. The same apparatus serves for macro- and micro-analyses.

For amounts of carboxyl carbon above 0.4 mg. the mean variability of results is of the order of ± 0.3 percent of the amounts measured. Microanalyses with samples down to 0.04 mg. of carboxyl carbon can be done with a mean error under 1 percent.

The application of the skatole color reaction to the determination of fructose in blood, R. M. REINECKE. (Univ. Minn.). (*Jour. Biol. Chem.*, 142 (1942), No. 2, pp. 487-490).—This color reaction was found to be quite sensitive but subject to a marked degree of inhibition by dilution with the protein-free blood filtrate. Using ethanol saturated with hydrogen chloride gas in place of the aqueous acid obviated this difficulty, but an interfering color due to the alcohol had to be avoided by heating the alcoholic acid and the sample together before rather than after adding the skatole, the acid alcohol and sample mixture being cooled before adding the color-producing reagent. Carried out as here directed, an accurate determination of 5 γ of fructose was possible, and as much as 80 γ of glucose did not cause appreciable interference.

Elimination of errors in the colorimetric assay of neutral urinary 17-ketosteroids by means of a color correction equation, N. B. TALBOT, R. A. BERMAN, and E. A. MACLACHLAN (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 211-218, figs. 3).—The authors show that interfering chromogenic substances may cause significant and variable errors of overestimation in the colorimetric assay of neutral urinary 17-ketosteroids. Except in unusual instances, these errors may be largely eliminated by means of a simple color correction equation without preliminary chemical purification of the crude neutral extract.

The quantitative determination of cytochrome *c*, V. R. POTTER and K. P. DuBois. (Univ. Wis.). (*Jour. Biol. Chem.*, 142 (1942), No. 1, pp. 417-426).—In a new method for the determination of cytochrome *c* in small quantities of tissue from experimental animals, customary methods of extraction are used but concentration is effected by precipitation with trichloroacetic acid. The determination is based on the quantitative spectrophotometric measurement of the change in extinction when cytochrome *c* is oxidized and reduced by specific enzymes. Results obtained with normal rat tissues and chick embryo are recorded.

Estimation of phenols in meat and fat, I. W. TUCKER. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 3, pp. 779-782).—A sample of 50 gm. of the meat or fat was extracted with 200 cc. of a mixture of equal volumes of alcohol and water, the filtrate being chilled and refiltered to remove most of the fat. If the extracts were highly colored, the color was removed prior to the second filtration by the addition (without heating) of a little decolorizing carbon. To a 5-cc. sample of extract (previously diluted with water if the quantity of phenol expected was large), 5 cc. of 0.5 percent solution of sodium borate ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$) and 1 cc. of 2,6-dichloroquinonechloroimide solution (0.05 percent in 7 percent alcohol) were added. After standing for an hour at room temperature the blue indophenol was extracted with 15 cc. of *n*-butyl alcohol. After the aqueous layer had been drained off, 2 cc. of butyl alcohol saturated with NH_3 was added. The butyl alcohol containing the dye was then measured and brought to a definite volume in order to correct for any volume changes due to the mutual solubilities of water, butyl alcohol, and ethyl alcohol. After the butyl alcohol layer had been filtered through paper the color intensity was read in a colorimeter, a filter transmitting at about 635 $m\mu$ being used,

Modification of Lane-Eynon method for sugar determination, A. C. HIRRETH and G. B. BROWN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 3, pp. 775-778).—To adapt the method to rapid routine work on numerous samples, an aliquot of the unknown sample is added directly to a measured quantity of standardized Fehling's solution (the quantity of sugar in the aliquot being less than the amount necessary to reduce all the copper in the Fehling's solution). Reduction is completed by titrating into the boiling mixture a standard solution of inverted sucrose. The quantity of sugar in the unknown is calculated from the amount of standard sugar solution necessary to complete the reduction of copper. Advantages of this modification are (1) use of a standard solution for all titrations, and (2) elimination of the cleaning or changing of burets between determinations. The modified procedure was compared with that of Quisumbing and Thomas (E. S. R., 46, p. 113) and with a ceric sulfate method, satisfactory agreement being obtained.

A modification of the Official method for the determination of nicotine in tobacco, K. E. RAPP, C. W. WOODMANSEE, and J. S. McHARGUE. (Ky. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 3, pp. 760-763).—A direct weighing of the nicotine silicotungstate after drying at 100° C. is substituted for the weighing of the ignited oxides. Time and attention required are decreased, and no loss of accuracy was detected.

A colorimetric reaction for testosterone, V. L. KOENIG, F. MELZER, C. M. SZEGO, and L. T. SAMUELS. (Univ. Minn. et al.). (*Jour. Biol. Chem.*, 141 (1941), No. 2, pp. 487-493, figs. 2).—The sample to be tested, dry or in about 0.4 cc. of 95-percent alcohol, is treated at ice-bath temperature with 2 cc. of sulfuric acid and carefully mixed therewith. The tube is then heated for 2 min. in boiling water and returned to the ice bath. After 5 min., 2 cc. of saturated aqueous thiocol (potassium gualacolsulfonate) and 0.3 cc. of 1-percent aqueous copper sulfate are added with stirring. The tubes are reheated in boiling water for 2 min., during which period they are stirred three times. The tubes are again placed in the ice-water bath and diluted to the 10-cc. mark with 50 percent sulfuric acid. After being transferred to a colorimeter tube, the solution is read against a blank containing the reagents, but not the hormone, in an Evelyn colorimeter equipped with a 635-m μ filter.

A calibration curve shows the light absorption by various quantities of testosterone with the 635 m μ filter. Spectral absorption studies of the colored compound showed that its maximum absorption is at about 639 m μ .

Androsterone and dehydroandrosterone did not interfere appreciably with the testosterone color. Of the 18 compounds besides testosterone tested, only Δ^4 -androstenedione-3,17, testosterone propionate, and testosterone oxime gave the reaction.

A low temperature wet ashing method applied to the study of the electrolyte composition of the ventricular musculature and lung parenchyma of the dog, E. H. WOOD. (Univ. Minn.). (*Jour. Biol. Chem.*, 143 (1942), No. 1, pp. 165-170).—The method consists of a preliminary digestion with nitric acid, followed by a perchloric-sulfuric acid mixture, the digestion then being completed with hydrogen peroxide. Results of determinations of various mineral constituents of the tissues named and of the blood serum after oxidation of organic matter by the method described are recorded.

Influence of solvent on the ultraviolet absorption maximum of vitamin A, K. MORGAREIDGE (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 9, pp. 700-702).—"With the aid of the Beckman quartz photoelectric spectrophotometer, the question of the influence of solvent on the ultraviolet absorption maximum of vitamin A has been reexamined. Special reference is made to differences

in behavior between ester and alcohol forms of the vitamin. A polar solvent results in high values and a shift of peak to shorter wave lengths as compared to data obtained in a nonpolar solvent. This effect is most pronounced for samples of unsaponifiable fractions of oils or vitamin A alcohol. The anomalous behavior of the U. S. P. reference cod-liver oil is pointed out, and the significance of the commercial standard conversion factor is discussed."

A fluorimetric method for the estimation of riboflavin in foodstuffs, M. SWAMINATHAN (*Indian Jour. Med. Res.*, 30 (1942), No. 1, pp. 23-35).—The method described in some detail as to reagents, apparatus, procedure, and calculations is an indirect one, directed on the one hand at removing interfering coloring matter that absorbs part of the activating and fluorescent light, thus causing the results to be too low, and on the other hand at removing blue fluorescent substances that interfere with accuracy in the opposite direction. The method adopted includes the following steps: (1) Extraction of the food material three times with hot 0.05 N H_2SO_4 ; (2) removal of coloring matter by the addition of a slight excess of N lead acetate in N acetic acid solution; (3) absorption of the riboflavin on fuller's earth; (4) elution of the riboflavin, using 50 percent aqueous alcohol containing sufficient NaOH to make a concentration of 0.25 N; (5) destruction of the riboflavin in one-half the eluate by treatment with 0.1 N NaOH at 100° C. in a water bath (this does not destroy the blue fluorescent materials associated with riboflavin in purified extracts of biological materials); (6) decolorization of the eluates by oxidation with cold dilute KMnO_4 , and the excess of KMnO_4 with H_2O_2 (this destroys the interfering coloring matter but not the riboflavin), followed by adjustment of the pH to 5 and dilution to known volume; and (7) estimation of the riboflavin present by a fluorimeter, applying the necessary corrections. Values obtained by application of the method to representative foods (4 cereals, 2 legumes, 2 vegetables, 2 fruits, rice polishings, and 3 samples of dried yeast) appeared to correspond well with the results of biological assays reported in the literature. Dried yeast contained from 27.5 to 64.8 μg per gram, but other foods were generally poor in the vitamin, legumes (1.8-2.5 μg .) and whole wheat (1.2 μg .) being somewhat superior to the others.

Fluorimetric estimation of riboflavin in urine, M. SWAMINATHAN (*Indian Jour. Med. Res.*, 30 (1942), No. 1, pp. 37-43).—Urines or urine extracts purified by the procedures of absorption on fuller's earth, elution, and decolorization contained varying amounts of coloring matter and blue fluorescent substances, so that procedures essentially the same as those described above for foodstuffs were adopted to allow for the interference caused by these colored and fluorescent substances. The calculations essential for making these corrections are illustrated by specific example. The daily excretion of riboflavin in a normal subject is reported to range from 320 to 360 μg . After oral ingestion of test doses of from 1 to 10 mg. of riboflavin, about 80 to 85 percent of the test dose is excreted in the following 24 hr.

Pasture studies.—XXIII, A proposed modification of the fluorimetric method for the estimation of riboflavin, R. A. CHAPMAN and W. D. McFARLANE (*Canad. Jour. Res.*, 20 (1942), No. 5, Sect. B, pp. 82-86, fig. 1).—The fluorimetric method for the determination of riboflavin in foodstuffs was modified to permit the use of the fluorimeter described by Froman and McFarlane (*E. S. R.*, 86, p. 10). Extracts were prepared by enzymatic digestion and purified by barium chloride precipitation and benzyl alcohol extraction. Photochemical reduction of riboflavin in the blank was effected by stannous chloride in benzyl alcohol solution. Recovery experiments conducted on a number of products showed that quite constant readings could be obtained on aliquots of the same extract, and that recoveries of added riboflavin were good. The possibility of

destruction of riboflavin during the enzymatic digestion was shown to be negligible, since a 98.5-percent recovery of riboflavin was obtained when a pure riboflavin solution was carried through the entire procedure. The riboflavin content of a variety of materials as determined by the modified procedure is reported.

The chemical determination of thiamine, E. R. KIRCH and O. BERGEIM. (Univ. Ill.). (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 575-588, figs. 2).—The chemical method developed for the determination of thiamin involved the reaction of the vitamin with diazotized ethyl *p*-aminobenzoate to form a stable pink to red colored compound which was quantitatively extracted from the aqueous solution by isoamyl alcohol. Maximum color was developed in 2 min. and results were reproducible, with readings on the Pulfrich photometer increasing proportionally with increase in the concentration of the thiamin. Tests of the reagent with a wide variety of compounds and with vitamins A and D showed that they offered no interference. Ascorbic acid, however, partially or entirely prevented color development, so that in the presence of this vitamin a modification was developed to permit preliminary oxidation of the ascorbic acid with 1 percent KMnO_4 (in acid solution). The method was found to be specific for free thiamin. The pyrophosphate of thiamin did not give the test, and the ester had first to be hydrolyzed to free the vitamin. This was accomplished in the case of yeast preparations by the action of the phosphatase in the yeast. This enzyme was liberated from the yeast cells by heating the yeast suspension in water or 30-percent ethyl alcohol at a temperature of boiling water for 2 or 3 min. A modification of the procedure was developed to make the test applicable to the estimation of thiamin in urine without any adsorption of the vitamin.

A modified micro-fermentation method for the estimation of thiamine, E. S. JOSEPHSON and R. S. HARRIS (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 9, pp. 755-756).—The method for the microestimation of thiamin in tissues and tissue fluids is described in detail as to reagents, preparation of samples, and fermentation procedure. It is based on the method of Schultz et al. (*E. S. R.*, 88, p. 293), and represents a revision using the Warburg technic. Interference by nonthiamin substances is corrected by sulfite treatment, and residual sulfite is eliminated by a peroxide treatment. This procedure is particularly applicable to the assay of tissues and fluids low in thiamin (10^{-6} gm. of thiamin per cubic centimeter) and in the measurement of thiamin degradation products in tissue metabolism and in the treatment of foods. Repeated estimations often show agreement within 2 percent, and the results agree within 5 percent with those by fluorometric assay.

Photoelectric determination of dl- α -tocopherol in serum, G. G. MAYER and H. SOROTKA (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 695-699).—The method described is an adaptation of that of Emmerie and Engel (*E. S. R.*, 82, p. 15), and consists essentially in alkaline digestion of the serum and introduction of formaldehyde and 95-percent ethyl alcohol into the digest, followed by a triple ether extraction. The ether of the washed and dried extract is replaced by benzene and this solution passed through a floridin column for the removal of carotenoids. The colorless filtrate is treated with ferric chloride- α, α' -bipyridine reagent, and the color is read in a Pulfrich photometer. The concentration in the serum is determined from this reading by reference to a curve constructed from the galvanometer reading of standard dl- α -tocopherol solutions. Satisfactory agreement in duplicate determinations and recoveries from 77 to 115 percent were obtained in the application of the method to 10 cc. or less of various serum samples. The level of tocopherol in normal human serum varied from 0.6 to 1.4 mg. per 100 cc.

On the colorimetric method for the determination of the K vitamins, J. V. SCUDR and R. P. BUHS (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 665-669, figs. 3).—The interference of slowly reducing tocopherylquinones upon the performance of the colorimetric oxidation-reduction method for the determination of the K vitamins (*E. S. R.*, 87, p. 626) was investigated. It was shown that the error caused by this interference can be eliminated by extrapolation of the transmittance time curves to zero time.

The calcium phosphate precipitate in limed cane juice, H. P. KORTSCHAK (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 3, pp. 105-109).—The investigation reported upon yielded the following findings:

Calcium phosphate as precipitated by liming cane juice is not a definite compound. After precipitation, the calcium content of the precipitate is increased by absorption of calcium hydroxide from the juice. When the juice and precipitate are heated, the pH drops, due to oxalation of the precipitate. Three major reasons for the high calcium content of clarified juice are (1) the original calcium concentration, (2) replacement of precipitated magnesia by lime, and (3) the reduced activity of the calcium ion.

AGRICULTURAL METEOROLOGY

Nocturnal wind-velocity, eddy-stability, and eddy-diffusivity above a citrus orchard, R. A. KEPNER, L. M. K. BOELTER, and F. A. BROOKS. (*Calif. Expt. Sta.*). (*Amer. Geophys. Union Trans.*, 23 (1942), pt. 2, pp. 239-249, figs. 4).—The study (1938-39) concerns analytical considerations for velocity profile, relations of velocity to height, velocity distribution, and atmospheric eddy-stability and diffusivity including mathematical treatment of the subject, with formulas. Undertaken with special reference to orchard heating, the observations were made largely during nights when there was a definite inversion and relatively low wind velocities. The conditions prevailing during nights when orchard heating studies were conducted at Riverside, Calif., were generally those of great stability or nearly so. The least stability occurred just above the tree tops. Although the gradient of temperature inversion is greatest in this region, the wind velocity gradient is also here at its maximum. In the case of density flow of cold air beneath stationary warm air, the velocity gradient would go to zero at some height, resulting in eddy decay. This condition favors the development of strong inversions. The stability criterion is decreased when the wind velocity increases or when the temperature inversion decreases below about 10° F. temperature difference between 5- and 60-ft. elevations.

The problem of the intensity-frequency of rainfall of varying duration over any given drainage area, T. E. W. SCHUMANN (*Amer. Met. Soc. Bul.*, 23 (1942), No. 8, pp. 328-341, figs. 2).—Reliable information on the frequency of heavy or excessive precipitation is the first requisite for computing the runoff. This paper discusses the various factors on which the intensity of rainfall depends, including its relations with duration, the period *N* (number of years in which rainfall of maximum intensity in inches per hour occurs), and the area over which the rain falls. Methods of presenting such data are discussed, and formulas are presented.

The sunspot-period and spring rainfall in the United States, H. H. CLAYTON (*Amer. Geophys. Union Trans.*, 23 (1942), pt. 2, pp. 284-286, figs. 2).

Monthly Weather Review, [September-October 1942] (*Mo. Weather Rev. [U. S.]*, 70 (1942), Nos. 9, pp. 203-224, pls. 10, figs. 16; 10, pp. 225-248, pls. 10, figs. 8).—In addition to meteorological, climatological, solar radiation, and sunspot data, No. 9 contains Comparative Observations with Friez-Type Radio-

sondes and Fergusson Meteorographs, by L. F. Hafer (pp. 203-208), and Precipitation Departures October 1941-July 1942 (pp. 208-209); and No. 10, A Study of Atmospheric Pollution, by W. F. Davidson (pp. 225-234).

Annual meteorological report (*Alaska Stas. Prog. Rpt. 1938-41*, pp. 15-16, 32-33).—The cardinal points of temperature, total precipitation, snow in inches, and cloudy, partly cloudy, and clear days annually and by months for the calendar years 1938-41 at the Fairbanks and Matanuska Stations are tabulated.

Meteorological observations, [1942], C. I. GUNNESS ET AL. (*Massachusetts Sta. Met. Ser. Buls. 637-648 (1942), pp. 4 each*).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1942, which shows that the mean pressure for the year was 30.004 in.; the mean temperature 48.8° F., as compared with the normal of 47.4°, highest 93° July 19, lowest -15° December 20-21; total precipitation 47.85 in., as compared with the normal 43.7 in., snowfall 33.75 in., as compared with the normal of 47.78 in.; mean cloudiness 55 percent, bright sunshine 58.5 percent; last frost in spring May 11, first in fall September 29; last snow April 11, first November 27.

Climatological data for the period 1911 to 1940, inclusive, for the Wind River Weather Station, Skamania County, Washington, W. J. ALLYN ET AL. (*U. S. Dept. Agr., Forest Serv., Pacific Northwest Forest and Range Expt. Sta., 1941, pp. [1]+23*).—Following detailed statements on such matters as the location of this meteorological station, its history, and the methods used, tabulations are presented relative to significant averages and extremes, mean temperatures, average maximum and maximum and average minimum and minimum temperatures, relative and minimum relative humidity, frost-free season, precipitation, snowfall and depth of snow, number of days of precipitation, wind movement, state of the weather (clear, partly cloudy, or cloudy), thunderstorm days, evaporation, wind movement over evaporation tank, and soil temperatures.

Hydrologic studies: Compilation of rainfall and runoff from the watersheds of the Shelby Loam and Related Soils Conservation Experiment Station, Bethany, Missouri, 1941, A. W. ZINGG. (Coop. Mo. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv., 1942, SCS-TP-39, Sup. 1, pp. [31], pls. 18*).

Hydrologic data: North Appalachian Experimental Watershed, Coshoc-ton, Ohio, 1940. (Coop. Ohio Expt. Sta. et al.). (*U. S. Dept. Agr., Hydrol. Bul. 4 (1942), pp. III+338, pls. 4, figs. 12*).

SOILS—FERTILIZERS

[**Soil and fertilizer investigations of the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1942, pp. 17-18, 21-24*).—C. S. Scofield reports progress on determining the water requirements of crop plants by using tensiometers as a guide in irrigation farming and the use of alfalfa for detecting a boron deficiency in the soil. R. O. E. Davis reporting on soils and fertilizer investigations discusses special services being done that are contributing to the war, high-analysis fertilizers, and progress of experiments designed to determine the chemical nature of soil growth substances. C. E. Kellogg points out the importance of soil surveys in wartime adjustments and presents a summary of areas surveyed and mapped during the fiscal year 1942.

[**Soils investigations by the Georgia Station**] (*Georgia Sta. Rpt. 1942, pp. 23-29, 63-66, figs. 4*).—Data on the available potash and available phosphate in

surface soils of Georgia are presented by means of maps of the State showing the pounds of available K_2O and available P_2O_5 and number of areas sampled. Progress on correlation of chemical soil tests with response of cotton to potash and lime and with response of cotton to phosphate and lime is summarized. Miscellaneous soil tests on pasture areas are also presented.

[Soils investigations by the Kansas Station]. (Partly coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1941-42, pp. 15-17*).—Progress on soil fertility investigations is summarized by W. H. Metzger; influence of the absolute reaction of the soil solution upon the growth and activity of *Azotobacter*, by P. L. Gainey; the influence of legumes and free-living organisms on the growth of plants and on the nitrogen balance of Kansas soils, by H. E. Myers; the storage, utilization, and evaporation of soil moisture, by J. C. Hide; and a study of the soil solution as governed by H-ion concentration and other factors and a study of replaceable cations and anions in some Kansas soils, both by A. T. Perkins.

[Soils and fertilizer investigations by the Oregon Station.] (Partly coop. U. S. D. A. et al.). (*Oregon Sta. Bul. 401 (1941), pp. 23, 75-77*).—Progress is reported on tests designed to determine the fertilizing value of turkey feathers. Increases in yield of corn and artichokes were obtained by using feathers.

Progress in soils work briefly presented include soil fertility trials, potassium in relation to soils and plant nutrition, minor elements in plant nutrition, drainage and improvement of heavy or alkaline soils, nitrate investigations as related to soil moisture, and effect on plant growth of irrigating soils with waste sulfite liquor.

[Soil investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 429 (1942), pp. 32-34*).—Soil structure is noted by F. G. Merkle as an important item in soil fertility; C. F. Noll calls attention to lime and phosphorus as primary soil needs; and J. W. White points out the improvement in yield of common grain crops by the use of lime and the variation of the lime requirements of legume crops.

[Soil investigations by the Utah Station] (*Farm and Home Sci. [Utah Sta.], 3 (1942), No. 4, pp. 8, 10*).—Information is presented on the effect of irrigation water on soil erosion, the effect of lining irrigation canals on conserving water, and a system of economic classification of irrigated farm lands from correlation studies of the Uinta Basin.

Preparing soil profile mounts: Method and demonstration, M. DROSDORF. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 40 (1942), p. 30*).—A method of preparing soil profile mounts is described. The method consists of applying a film of clear lacquer to a rectangular piece of pasteboard and sprinkling on it an excess of dry soil.

[Soil Survey Reports, 1935 and 1936 Series] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1935, No. 23, pp. 113, pls. 4, figs. 2, map 1; 1936, No. 13, pp. 67, pls. 3, fig. 1, map 1*).—These surveys were made in cooperation with the California and Utah Experiment Stations, respectively: 1935, No. 23, Pixley area, Calif., R. E. Storie et al.; and 1936, No. 13, Virgin River Valley area, Utah-Ariz., F. O. Youngs et al.

The moisture potential of soils, P. R. DAY. (Univ. Calif.) (*Soil Sci., 54 (1942), No. 6, pp. 391-400*).—The author defines the moisture potential as the chemical potential of water in ergs per gram, a quantity identical with the partial molal free energy of water in all respects except for the unit of mass employed. In accordance with previous terminology, the moisture potential of an aqueous solution is called the "osmotic potential." A general relationship between composition and osmotic potential is presented, and methods of calcula-

tion are discussed. It is shown that the moisture potential of a soil may be calculated from tensiometric, centrifugal, or pressure-membrane methods, provided the osmotic potential and the partial specific volume of water in the liquid phase are known. The theory of the cryoscopic method is developed, and an equation similar to that of Schofield and Botelho da Costa (E. S. R., 81, p. 174) is derived. A comparison of cryoscopic data with data from static vapor-pressure measurements demonstrated that the freezing method must be further improved before results completely consistent with thermodynamics can be obtained. A possible explanation of the discrepancies is that irregular freezing results in excessive withdrawal of water from the liquid phase in the localized areas in which ice crystals have formed.

The influence of porosity of some orchard soils upon root behavior, A. T. KNIGHT. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 23-26, figs. 2; *abs. in Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, p. 180).—Artificial soil-sand mixtures and undisturbed soil cores were used to investigate some of the fundamental effects of soil erosion as determined from the growth of alfalfa roots.

Aggregation of an orchard soil under sod, mulch, and cultivation, A. L. HAVIS. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), p. 28).—The degree of aggregation of the A and B horizons of Wooster silt loam was determined for areas that had been under sod, mulch, and cultivation for long periods of time. From 2 to 6 yr. of the above treatment gave little differences in aggregate size distribution. The author thus suggests that only relatively long-time treatments result in the larger soil aggregates, and that the number and stability of the aggregates was increased more quickly under the mulch than under bluegrass sod.

A study of the effects of silty irrigation water from an intermittent stream on crops and soils in controlled plots, J. L. GARDNER and D. S. HUBBELL. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 12, pp. 1090-1101, figs. 3).—Three years' results with corn, beans, and oats grown on plats watered with silty water are compared with the same crops grown on plats watered with clear water. The workers conclude that good crops can be obtained by irrigating with the relatively clearer of the intermittent arroyo flows and at the same time the land surface will not be raised so as to make cultivation impracticable. Plats watered with every flow had not differed significantly in crop yields from those watered with the clearer water, but the amount of sediment deposited indicates that continuation of this type of irrigation practice would be important because of the raising of the soil surface.

The influence of periodic close grazing and pasture fertilization upon erosion control, D. B. JOHNSTONE-WALLACE, J. S. ANDREWS, and J. LAMB, JR. (U. S. D. A. coop. [N. Y.] Cornell Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 11, pp. 963-974, figs. 4).—This article summarizes investigations on the effect of fertilizers, lime, and close grazing with sheep on soil and water conservation, animal gains, and plant species changes on Lordstown flaggy silt loam and Bath flaggy silt loam soil under the climatic conditions prevailing at the high altitudes in southern New York.

Stubble-mulch farming for soil defense, L. S. CARTER and G. R. MCDOLE (U. S. Dept. Agr., *Farmers' Bul.* 1917 (1942), pp. 11+24, figs. 26).—An illustrated publication presenting information on advantages of, and methods and equipment for putting into effect, a system of stubble-mulch farming.

The maintenance of soil productivity (Montana Sta. [Bien.] Rpt. 1941-42, pp. 10-11).—The effect of different soil management systems on soil productivity under dry land and irrigated land conditions is discussed by A. H. Post.

The fractionation of the organic matter, including nitrogen, of certain soils and its relation to their quality, M. R. F. ASHWORTH (*Jour. Agr. Sci. [England]*, 32 (1942), No. 4, pp. 349-359).—Proximate determinations of the organic fractions in the upper layers of seven different soil profiles, ranging from grassland to forest and peat soils, are reported.

Changes occurring in the organic matter during the decomposition of compost heaps, M. R. F. ASHWORTH (*Jour. Agr. Sci. [England]*, 32 (1942), No. 4, pp. 360-372, figs. 13).—The decomposition of composts of grass, straw, and two peats made up to the same nutrient content was studied by means of taking samples from compost heaps of the different materials at intervals.

The forest humus layers of Ohio, L. W. GYSEL (*Ohio State Univ., Abs. Doctoral Diss.*, No. 38, (1942), pp. 167-175, fig. 1).—The more important forest humus layers of Ohio are classified and described. Physical and chemical properties of the forest humus layers are given.

The nature and properties of peats in New Jersey, S. A. WAKSMAN and H. B. SCHULHOFF. (N. J. Expt. Stas. et al.). (*Soil Sci.*, 54 (1942), No. 6, pp. 447-461, fig. 1).—This paper presents a survey of the peat resources of the State of New Jersey, a type of land covering about 8 percent of the total surface area and varying greatly in depth, origin, and chemical composition. The peat types of the State are divided into four groups—sedge and reed peat, forest peat, fresh-water alluvial peat, and tidal marsh. Moss peat is entirely absent, although sphagnum is growing on the surface of many peat areas in the State. The sedge and reed, or lowmoor peats, predominate in the northern or glaciatic areas of the State, whereas the forest peats and the salt marshes predominate in the southern or Coastal Plain areas.

The peats have been extensively utilized for various agricultural and industrial purposes, depending upon the nature of the specific variety and upon the drainage conditions and geographical location of the bogs.

Lime and legumes produce good yields on both fertile and poor silt loam soils, H. B. VANDERFORD (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 12, p. 7).—General factors to be considered in liming various soils and crops are presented, along with data on the effect of lime on soil acidity and crop yields.

Carbon-nitrogen ratios in organic fertilizer materials in relation to the availability of their nitrogen, E. J. RUBINS and F. E. BEAR. (N. J. Expt. Stas.). (*Soil Sci.*, 54 (1942), No. 6, pp. 411-423).—A series of 34 organic ammoniates and waste organic materials were tested with regard to the availability of their nitrogen. Ratings of these materials, particularly of their insoluble nitrogen, were made by vegetative, nitrification, and permanganate methods. A study as to the applicability of the principle of the C:N ratio in explaining the estimated availability of the nitrogen of these materials indicated that this is a valuable supplemental aid in determining the quality of the nitrogen in these materials. In some instances it was found necessary to apply a correction to the C:N ratio by eliminating the carbon of the lignin in the material. For certain materials, however, the application of this correction factor failed to bring the products into line with the known availability of their nitrogen.

Loss of ammonia from ammonium sulfate applied to alkaline soils, T. N. JEWITT (*Soil Sci.*, 54 (1942), No. 6, pp. 401-409, fig. 1).—Gaseous ammonia was found to be lost in considerable quantities when ammonium sulfate was applied to certain alkaline Sudan soils. The loss takes place over long periods from the moist soil at a rate greatly influenced by the rate of application of the fertilizer and little influenced by the moisture content, except near the air-dry condition. The author suggests a mechanism for the loss, according to which the base-exchange equilibrium in the soil tends to maintain the con-

centration of ammonia in the soil solution at a constant level, whereas the normal buffered state of the soil solution maintains constant the hydroxyl-ion concentration. Under these circumstances the ammonia is lost as from a dilute solution at a constant rate proportional to the ammonia concentration in the soil solution. This loss will continue (if the soil is kept moist) for a long or short period, depending on the reserves of ammonium ions in the base-exchange complex. If the exchange capacity is low, the rate of loss of ammonia is not maintained constant and is comparable with that from a dilute solution, the ammonia content of which declines progressively as evaporation proceeds. It is considered probable that commercially important losses of ammonia occur in the field when ammonium sulfate is broadcast on alkaline soil.

Enzymatic vs. microbial concepts of urea hydrolysis in soils, J. P. CONRAD. (Univ. Calif.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 12, pp. 1102-1113, figs. 2).—Additional information is presented on investigations attempting to determine whether micro-organisms or enzymelike substances bring about urea hydrolysis in the presence of toluene and other antiseptics.

Small amounts of phosphate, potash: Yazoo River soils, R. KUYKENDALL. (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 12, p. 7).—The author points out the advisability of applying some form of nitrogen every year and potash and phosphorus occasionally to take care of any deficiencies that might exist in the soils near the Yazoo River.

Dephosphorylation of organic phosphorus compounds by soil catalysts, H. T. ROGERS. (Iowa Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 6, pp. 439-446, fig. 1).—Calcium glycerophosphate when incubated at pH 4.0 and 45° C. in toluene-treated soil underwent 66 percent mineralization in 18 hr. from an initial concentration of 210 p. p. m. of organic phosphorus. Dephosphorylation of nucleic acid by soil catalysts was only about one-third as rapid as the break-down of calcium glycerophosphate when optimum conditions for the respective systems were maintained. The optimal reaction (pH 6.2-7.0) and temperature (about 60°) for the dephosphorylation of nucleic acid by soil catalysts were found about the same as the optima for the root-borne nuclease system. The significance of the presence in soils of catalysts capable of dephosphorylating organic phosphate compounds is discussed, with special reference to the possible value of organic phosphate fertilizers in obtaining better penetration of phosphates in soils.

The beneficial effect of preliming upon PO_4 uptake from incorporations of monocalcium phosphate, W. H. MACINTIRE and B. W. HATCHEE. (Tenn. Expt. Sta. et al.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 11, pp. 1010-1016).—The effect of preliming with CaCO_3 upon the recovery of P_2O_5 of subsequent additions of water-soluble monocalcium phosphate was determined for 35 soils which included 12 subsoils and eroded phases. The authors conclude that the results indicate the advantage of preliming as a means of a more effective utilization of incorporations of superphosphate.

Soil liming investigations.—VI, Response of crimson clover to boron with and without lime on Coastal Plains soils, J. A. NAFTEL. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 11, pp. 975-985, figs. 8).—In continuation of this series (E. S. R., 78, p. 309), results of this investigation indicate that growth of crimson clover on the lower Coastal Plains soils and on other soils low in boron was benefited by including boron in the fertilizer.

The production of a lime-induced manganese deficiency on an eroded Kentucky soil, G. D. SHERMAN, J. S. MCHARGUE, and W. S. HODGKISS. (Ky. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 12, pp. 1076-1083, fig. 1).—Liming an acid clay soil, having an extremely low manganese content, to a neutral or alkaline reaction was found to bring about a manganese deficiency.

Zinc relationships of some Utah soils, D. W. THORNE, W. D. LAWS, and A. WALLACE. (Utah Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 6, pp. 463-468).—The authors find that in Utah the zinc-deficiency symptoms usually appear on fruit trees growing on noncalcareous soils derived principally from granite, gneiss, quartzite, or related rocks, and have not been observed on soils derived principally from limestone. The zinc content of calcareous soils was found to be almost twice that of noncalcareous soils. Samples of rock which serve as parent materials for noncalcareous soils contained about the same amount of zinc as samples of various formations of limestone. The zinc in the granite, gneiss, and quartzite samples studied was more soluble than that in limestone. Apparently zinc is lost more rapidly from silicate rocks than from limestone rocks during weathering processes. In the soils studied, no consistent correlations were found between values for any of the four factors determined—total zinc, available zinc, organic matter, and pH.

Complete fertilizer needed by soils of south Mississippi, R. COLEMAN (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 12, p. 7).—A complete fertilizer, high in potash, gave the most profitable production of cotton, but it is suggested that a good crop of Austrian Winter peas fertilized with basic slag can largely replace the nitrogen and phosphorus for Brandon silt loam.

Commercial fertilizers, 1942, E. R. TOBEY (*Maine Sta. Off. Insp.* 185 (1942), pp. 41-80).—Analytical data resulting from the 1942 inspection of commercial fertilizers, liming materials, and gypsum are here recorded.

Commercial fertilizers in 1941-42, G. S. FRAPS, T. L. OGIER, and S. E. ASBURY (*Texas Sta. Bul.* 619 (1942), pp. 45).—Statistics on fertilizers sold in Texas, information on the fertilizer law, and the analysis of fertilizers are presented in accordance with the fertilizer control law. Other items briefly presented include fillers, non-acid-forming fertilizers, comparison of soft phosphate with colloidal clay and phosphate rock, secondary fertilizing elements, sodium fluorescein as a fertilizer, root stimulants, vitamin B₁, and fertilizers for water culture.

AGRICULTURAL BOTANY

The *Erwinia*-coliform relationship, R. P. ELROD (*Jour. Bact.*, 44 (1942), No. 4, pp. 433-440).—In this paper the term *Erwinia* is taken to mean the so-called soft-rot group of phytopathogenic bacteria. The manner in which its species ferment lactose would tend to classify them as aberrant forms. On the basis of IMViC patterns the majority appear to approximate *Escherichia freundii*. On the other hand, according to gelatin-liquefying ability, motility, and acid production in glycerol, they seem closer to *Aerobacter cloacae*. Of the cultures tested, 16 were able to macerate vegetable tissues, a character not possessed by any of the 50 coliform cultures. All but 2 of the *Erwinia* isolates fermented pectin in a synthetic medium, while 22 of the 50 coliform organisms, including 3 *Escherichias* of fecal origin, did so. There was no correlation between ability to decompose plant tissue and fermentation of pectin. On the basis of this macerating ability, it is contended that the placing of soft-rot bacteria in a genus (*Erwinia*) separate from the coliforms is valid. At the same time the close relationship of the two groups is recognized.

Difficulties in defining the genus *Alcaligenes*, H. J. CONN. (N. Y. State Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 6, p. 721).—An abstract.

A test for sexual fusion in bacteria, J. W. GOWEN and R. E. LINCOLN. (Iowa Expt. Sta.). (*Jour. Bact.*, 44 (1942), No. 5, pp. 551-554).—Character differences within a bacterial species furnish the necessary material for such a test. These may be referable, e. g., to white v. yellow colony color, rough v. smooth colony

type, cataphoric movement to + or - poles, or any other character pairs for which it is possible to establish strains giving consistently the same progeny types. Applying the technic to *Phytomonas stewartii*, no evidence of any sexual fusion under the experimental conditions was indicated, but this does not mean that it may not occur in other species or under other conditions. The methods described are believed general enough to facilitate investigation of this problem in any species.

A simple procedure for the recovery of agar, G. P. BLUNDELL (*Science*, 97 (1943), No. 2507, p. 76).—The autoclaved used agar is frozen overnight, rapidly melted in warm alcohol, filtered out, washed in distilled water, and dehydrated by washing with alcohol.

The dehydrogenation of alcohols by streptococci of group B, I. C. GUNBALUS and A. J. WOOD. (Cornell Univ.). (*Jour. Bact.*, 44 (1942), No. 5, pp. 523-528).—Resting cell suspensions of *Streptococcus mastitidis* (=agalactiae) were found to oxidize a number of alcohols, several, including certain normal and secondary alcohols, tertiary amyl alcohol, and 2,3-butylene glycol, being more active as H₂ donors to methylene blue than glucose. Methyl alcohol was not activated. Glycerol was dehydrogenated rapidly by some strains. An adaptive mechanism was present in some strains for dehydrogenating certain sugars, as, e. g., galactose. A strain of *Escherichia coli* compared was found to dehydrogenate alcohols very slowly.

A staining technique for evaluating the toxicity of an antibiotic substance of microbiological origin, H. KATZNELSON. (Cornell Univ. et al.). (*Canad. Jour. Res.*, 20 (1942), No. 12, Sect. C, pp. 602-608, figs. 2).—Absorption of neutral red by dead cells of *Schizosaccharomyces pombe* is used as an index of the toxicity of an antibiotic agent of bacterial origin.

Bacteriostatic and bacteriolytic properties of actinomycetes, M. WELSCH. (N. J. Expt. Stas.). (*Jour. Bact.*, 44 (1942), No. 5, pp. 571-588).—Ability among actinomycetes to dissolve heat-killed gram-negative and gram-positive bacteria was significantly associated with ability to dissolve living gram-positive organisms only, indicating the same lytic principle to be involved in the action on these three substrates. Even sterile filtrates of these actinomycetes possessed similar capabilities, though they were less active against the living gram-positive bacteria. No lytic action was ever observed against living gram-negative organisms. The growth-inhibiting properties of the group appeared to be significantly associated with bacteriolytic action on living gram-positive bacteria. The group of various antibacterial properties recognized in *Actinomyces* G, designated as the "actinomycetin type" of activity, is common among actinomycetes, and this type was found in species of three genera, viz, *Actinomyces*, *Proactinomyces*, and *Micromonospora* and without relation to taxonomic position of antagonist. The significance of the gram-staining properties in relation to susceptibility or resistance of bacteria to the actinomycetin type of activity was demonstrated by examining a large number of strains. No evidence was found for production of adaptive lysins or true lysozyme. There are 36 references.

An antibacterial substance produced by *Penicillium claviforme*, E. CHAIN, H. W. FLOREY, M. A. JENNINGS, and D. CALLOW (*Brit. Jour. Expt. Pathol.*, 23 (1942), No. 4, pp. 202-205).—A crystalline substance inhibitory to gram-positive and gram-negative organisms was isolated from the metabolic products of this fungus. Its action is believed to be bactericidal and it is named "claviformin." It proved toxic to animal tissues in concentrations rendering any therapeutic application unlikely, and its action was considerably inhibited by serum.

Investigation into the production of bacteriostatic substances by fungi.—
I. Preliminary examination of 100 fungal species, W. H. WILKINS and G. C. M. HARRIS (*Brit. Jour. Expt. Pathol.*, 23 (1942), No. 4, pp. 166-169).—From the results of this preliminary study it appears that *Aspergillus* spp. are the most promising (about 40 percent positive) of the group investigated, which also included many species of *Penicillium* (about 25 percent positive) and miscellaneous Fungi Imperfecti (mostly negative).

Mechanics of budding and of conjugation in yeasts, W. J. NICKERSON (*Jour. Cell. and Compar. Physiol.*, 19 (1942), No. 3, pp. 379-382, figs. 4).

The relation of yeast multiplication to the composition of apple juice, H. DICKSON (*Ann. Bot. [London], n. ser.*, 6 (1942), No. 24, pp. 637-644, figs. 7).—Brief descriptions are given of the results of laboratory experiments on the fermentation of apple juice, with special reference to N consumption.

A taxonomic study of the genus *Hansenula*, C. L. BEDFORD. (Univ. Calif.). (*Mycologia*, 34 (1942), No. 6, pp. 628-649).—A morphologic and taxonomic study (involving new nomenclature) is reported of 100 cultures of yeasts obtained as species of *Hansenula* from various sources in the United States, Europe, Asia, and South Africa. There are 24 references.

Some additional species of *Ceratostomella* in the United States, R. W. DAVIDSON. (U. S. D. A.). (*Mycologia*, 34 (1942), No. 6, pp. 650-662, figs. 4).—Three of the five species considered in this taxonomic study are described as new species. There are 23 references.

Some new and interesting fungi from Mount Shasta, L. BONAR and W. B. COOKE. (Univ. Calif.). (*Mycologia*, 34 (1942), No. 6, pp. 663-668).—Species of *Pleospora*, *Leptosphaeria*, *Metasphaeria*, *Bifusella*, *Lophodermium*, *Phyllosticta*, *Septoria*, *Ollula*, and *Ramularia* are included.

A contribution to our knowledge of *Rivea corymbosa*: The narcotic *ololiuqui* of the Aztecs, R. E. SCHULTES (Cambridge, Mass.: Bot. Mus. Harvard Univ., 1941, pp. [5]+45, [figs. 4]).—The monograph (with 61 references) deals with the history and identification of this drug plant, its nomenclature and taxonomy, its chemical composition and that of related Convolvulaceae, its uses, its vernacular names, and plants confused with it.

Identification of Japanese maples, L. CROIZAT (*Amer. Nurseryman*, 76 (1942), No. 9, pp. 5-7, figs. 12).

The carnivorous plants, F. E. LLOYD (Waltham, Mass.: Chron. Bot. Co., 1942, pp. XV+352, pls. [39], figs. 11).—The purpose of this monographic work is to give a historical review and summary account of present knowledge about the carnivorous or insectivorous plants. Of these there are about 450 or more species of 15 genera belonging, aside from the fungi, to 6 families. These, with their geographical distribution, are tabulated. The accounts rest in the first instance on studies of actual material collected by the author and received from many other sources. Illustrations are mostly by the author. The principle underlying the arrangement of textual material is the increasing complexity of the traps rather than systematic relationship. Literature references terminate each of the 14 chapters.

The vegetation of Trumbull County, Ohio, R. E. SHANKS. (Ohio State Univ.). (*Ohio Jour. Sci.*, 42 (1942), No. 6, pp. 220-236, figs. 3).—A study of the original major forest vegetation types of the glaciated plateau of northeastern Ohio.

A new perspective in the halophytes, V. J. CHAPMAN (*Quart. Rev. Biol.*, 17 (1942), No. 4, pp. 291-311, figs. 11).—A critical discussion (41 references) of the more recent papers, with the object of indicating the most profitable lines of future research.

An ecological and taxonomic study of the algae of British soils.—II, Consideration of the species observed, F. E. FRITSCH and R. P. JOHN (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 23, pp. 371–395, figs. 8).—New taxonomy is involved, and nine genera are newly recorded for the British Isles. There are 27 references.

The interaction between thiamine and four fungi, F. KAVANAGH (*Bul. Torrey Bot. Club*, 69 (1942), No. 9, pp. 669–691, figs. 16).—*Phycomyces blakesleeanus* destroyed thiamin with liberation of pyrimidine and destroyed thiazole. Excess thiazole in a thiamin solution increased growth, but excess pyrimidine did not affect growth. *Phytophthora cinnamomi* apparently utilized thiamin without destroying thiazole or pyrimidine, and growth in a thiamin solution was not affected by the amount of thiazole and pyrimidine therein. *Mucor ramannianus* in a solution containing thiamin alone or with thiazole stopped growth before more than half the latter was removed, and good growth was obtained only in presence of a large amount of thiazole. It synthesized pyrimidine. *Sclerotium rolfsii* in thiamin solutions synthesized considerable amounts of thiazole and under certain conditions apparently destroyed it. It grew much more in the thiamin solution than any of the other fungi. The thiamin requirements of these four fungi were not influenced by the composition of the medium. Destruction of thiazole may not be related to use of thiamin in metabolism but rather to the ability of the fungus to synthesize thiamin from the two intermediates. There are 30 references.

The effect of vitamin B₁ on the concentration of glucose optimal for the fruiting of certain fungi, L. E. HAWKER (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 24, pp. 631–636).—In a wide range of fungi, fruiting was found to depend on a balance between the concentrations of carbohydrate (glucose) and vitamin B₁. In all species examined, including some which fruit freely in the absence of growth substances in the substrate, fruiting fell off if the sugar concentration was increased sufficiently. On the other hand, addition of vitamin B₁ raised both the optimum and maximum concentrations of glucose for fruiting. These data may offer a clue to the interpretation of the role played by vitamin B₁ in the production of fruit bodies by fungi.

The mechanism of auxin action, B. COMMONER and D. MAZIA. (Univ. Mo. et al.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 682–685, fig. 1).—From the results of an experiment designed to elucidate the effect of auxin on the salt absorption process in potato tuber slices, it is deemed likely that the effect of auxin on cell enlargement is a consequence of its effect on salt absorption and the water uptake which inevitably accompanies such an increase in sap solute. Auxin stimulates cell enlargement by augmenting the intensity of the osmotic driving force. The dependence of cell enlargement on respiratory processes may be viewed as a consequence of the respiratory dependence of the salt absorption process, and the evidence points to the four-carbon acid metabolism as the respiratory agent particularly related to these phenomena.

The use of methyl ester of α -naphthaleneacetic acid for inhibiting sprouting of potato tubers, and an estimate of the amount of chemical retained by tubers, F. E. DENNY (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 6, pp. 387–403, figs. 4).—Irish Cobbler tubers were placed in bins soon after harvest in the presence of methyl ester-treated paper towels interspersed evenly among them and at the rate of 100 mg. to 1 kg. of potatoes. Sprouting was completely inhibited to the end of the test (October 3 to May 6), though control tubers sprouted freely. Tests with other methods or rates of incorporation of the chemical gave comparable results. The hyponastic response to the methyl ester vapor given by the first well developed leaves at the tips of young potato

plants was used as the basis of a method for estimating the amount of chemical taken up by the tubers from the treatments. In the test above detailed not more than 5 mg. to 1 kg. of tissue were retained, and at least four-fifths of this was in the peel. The flesh of boiled or baked tubers gave negative or very weak tests for the methyl ester, indicating amounts at least lower than 1 mg. to 1 kg. of the cooked flesh. An injury occurred on 5-10 percent of the number of tubers in the chemically treated lots consisting of hard, lumplike excrescences from enlargement of underlying tissue, but no rot developed near them. Germination of treated tubers was reduced, but washing with soap and water or treatments with ethylene chlorohydrin, alone or with sodium thiocyanate or thiourea, improved it. It is believed that the sprout dormancy induced by the methyl ester treatment is more pronounced than that normal for the variety.

A physiological study of the winter wheat plant (*Kansas Sta. Bicn. Rpt. 1941-42, p. 30*).—A brief report is given by E. C. Miller.

Growth rates of maize under field conditions, R. A. BAIR. (Iowa Expt. Sta. coop. U. S. D. A.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 619-631, figs. 6).—Growth curves obtained by measuring dry weights of four corn varieties weekly during the growing seasons of 1938-39 indicated that they constituted a single population in their percentage responses to the weekly complex of environmental conditions. The dry weight curves were sigmoid, accelerating during the first 40-50 days, increasing uniformly for the next 50-60 days, and dropping off to maturity at 120-130 days. The 1939 plantings were made 2 weeks earlier than in 1938. During the first 50 days after planting the earlier plants developed more slowly and then showed a sharp rise. Vegetative and total growth for the 1939 (early) plantings were superior for all subsequent points on the curves. Weekly dry weight increments, over an 8-week period when the leaf area was about constant, were uniform in 1938 but varied significantly in the cooler, wetter 1939 season. Poor distribution of rainfall apparently accounted for the failure of the dry-weight curve to approximate the growth possibilities represented by the temperature index curve in 1938. There are 15 references.

An investigation of physiological methods of determining nutrient deficiencies in sugar-cane, H. EVANS (*Ann. Bot. [London], n. ser., 6 (1942), No. 23, pp. 413-436, figs. 9*).—This report, having to do with examination of the leaf or stem injection method and the growth increment method, appears to indicate that the first gives but little promise for sugarcane. On the other hand, the growth responses of the crop actually growing in the areas concerned appear to furnish an accurate and reliable technic.

Hydrogen ion concentration in relation to absorption of inorganic nutrients by higher plants, D. I. ARNON, W. E. FRATZKE, and C. M. JOHNSON. (Univ. Calif.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 515-524, figs. 2).—Tomato, lettuce, and Bermuda grass plants 5 weeks old and grown under favorable conditions were held for 96 hr. in a series of nutrient solutions ranging at 1 pH steps from pH 3 to 9. Root injury from reaction was apparent only at pH 3 where no absorptions (even suggestions of loss) of Ca and phosphate were evident. For tomato and lettuce this reaction was also wholly unsuited to absorption of other ions tested. Except for phosphate absorption, which exhibited a marked decrease at pH 9, no other untoward effects were noted for this reaction. There was evidence of lower Ca absorption particularly by tomato and lettuce, from strongly acid solutions (pH 4 and 5) than at higher values. No profound effects of external reaction between pH 4 and 9 on the absorption of Mg, K, and nitrate were found.

Influence of hydrogen ion concentration on the growth of higher plants under controlled conditions, D. I. ARNON and C. M. JOHNSON. (Univ. Calif.)

(*Plant Physiol.*, 17 (1942), No. 4, pp. 525-539, figs. 4).—The water culture method described and here used for studying the effects of external reaction within the 3-9 pH range provides for maintenance of the same concentration of Ca, Mg, K, nitrate, and phosphate ions and for the availability of Fe and Mn throughout the range. Results indicated that profoundly adverse effects of H- or OH-ion concentration, isolated from other variables, occur only at extremes of acidity or alkalinity. With tomato, lettuce, and Bermuda grass, complete growth failure occurred at pH 3 and a marked decline at pH 9. Within a relatively wide range between pH 4 and 8, fluctuations in H-ion concentration were tolerated by plants, provided an adequate supply of all nutrient elements was maintained. Growth of tomato and lettuce in acid nutrient solutions at pH 4 and 5 was favorably affected by increasing the Ca concentration. At pH 6, however, the growth at low and high Ca concentrations was equally favorable. The external reaction of the nutrient solution had no significant effect on the pH of the expressed sap of either shoots or roots, with the possible exception of extremes unfavorable to growth.

Plant nutrition and the hydrogen ion.—III, Soil calcium and the oxalate content of spinach, R. A. SCHROEDER and W. A. ALBRECHT. (*Mo. Expt. Sta. (Bul. Torrey Bot. Club*, 69 (1942), No. 8, pp. 561-568, figs. 4).—As further results of these studies (*E. S. R.*, 88, p. 209), by using the oxalate concentration in spinach as an index of plant performance on soils with increasing Ca under pH 5.2 and 6.8 it was shown that the oxalate concentration in the crop on the acid soil was higher than on the neutral soil and the total in the crop was also higher. When the total oxalate was related to the totals of Ca and Mg it was indicated that on the acid soil the amounts of Ca and Mg taken together were more than the equivalent of the oxalate. With larger additions of Ca to the soil these two basic cations were present in increasing surplus over the oxalate. On the neutral soil the combined amounts of Ca and Mg were not the equivalent of the oxalate except for the soil with the highest Ca application, which gave a spinach crop with excess of oxalate. This raises the question whether this excess may not represent a disturbing condition in the form of Ca deficiency for the plant functions as normal growth.

If the oxalate is considered as removing Ca and Mg out of the reaction in animal digestive processes, these results suggest that Ca as a soil treatment for spinach on an acid soil may provide the crop with Ca and Mg as surpluses over that combined with the oxalate and therefore may contribute some of these minerals of nutritional use. If this soil treatment is applied on a neutral soil, or as a carbonate that should result in neutrality, it is suggested that the crop may possibly be so deficient in bases with respect to its oxalate content that this excess oxalate may not only make the spinach of no nutritional value as a provider of these bases, but may even make it injurious as this excess oxalate disturbs the Ca coming from other food sources. The composition data of the spinach suggest the need for consideration to both the Ca and the Mg supplies, and to the reaction of the soil growing this crop if the fullest values in terms of its content of these nutrient bases are to be realized.

Effect of cations (K, Na, Ca) on conversion of sugar in plants, A. KALINKEVICH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 33 (1941), No. 3, pp. 251-253).—From tests in which Ca, K, and Na were supplied to Russian dandelion (*Taraxacum koksaghyz*), it is concluded that Ca favors the accumulation of glucose and Na of fructose, whereas the place of K as regards its action on monosaccharides is between Ca and Na. Sucrose accumulation is favored by Na probably because it promotes the conversion of fructose to glucose and the latter is consumed more rapidly by the process through which sucrose is built up. The

flowering shoots were characterized by a high sugar content, monosaccharides constituting the larger part with glucose predominating. Glucose takes a more active part than fructose in supplying the flowers with sugar.

Growth responses of barley seedlings in relation to potassium and sodium nutrition, W. R. and E. MULLISON. (Purdue Univ.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 632-644, figs. 3).—The effects of varying the anions in a nutrient solution where K was replaced by Na differed but little from those effects, already reported (E. S. R., 86, p. 757), under the presence of K. The severe dieback here reported of plants grown without either Na or K proved due to a K deficiency rather than to interrelations of PO_4 and NO_3 or of Ca and Mg, or a toxicity of one of them. About 30-40 p. p. m. of K was optimum for growth of young barley seedlings under the test conditions. When both Na and K were absent, K-deficiency symptoms appeared much earlier and more severely than when Na was present. In fact, this was one of the earliest of any deficiencies to appear in barley. In young growth stages Na replaces K to some extent, though it cannot do so entirely. This is especially marked when the amount of K is low. In studies of the effects of K at various nutritional levels Na must be excluded from the nutrient solution to obtain an accurate picture of the role of K in plant metabolism. There are 19 references.

Studies on the partition of the mineral elements in the cotton plant.—**III, Mainly concerning nitrogen,** E. PHILLIS and T. G. MASON (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 23, pp. 469-485, figs. 6).—Continuing the series (E. S. R., 85, p. 455), the problem of protein regulation in the leaf is considered. From the fact that disks punched from leaves and floated on a nutrient solution containing inorganic N can form protein as readily as intact leaves, it is concluded that protein synthesis is determined by factors in the leaf. In four further experiments under a wide range of conditions it is shown that the protein-N level is largely determined by the crystalloid-N level (dry weight basis). As the latter level is increased, there is a rise in protein-N level to a maximum, after which a further rise in crystalloid-N causes a decline in protein-N. It is pointed out that this type of relation is characteristic of apolar adsorption. Rather limited data on the relation between polysaccharides and total sugars and between insoluble and soluble P suggests that adsorption may also play an important role in determining the levels of polysaccharide and insoluble P, respectively.

Studies on foliar hydration in the cotton plant, I, II, T. G. MASON and E. PHILLIS (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 23, pp. 443-453, figs. 5; pp. 455-468, figs. 5).—Two papers are presented.

I. The effects of potassium supply and size of plant.—An increase in K supply to plants growing in pots filled with sand led to reduced hydration and increase in size of plant, whereas with plants growing in the open in soil an increase in K led to increase in both hydration and size. Further tests with sand in pots under short daylight to ease the water strain indicated that under these conditions increased K was associated with increased size and hydration as in the soil tests above, whereas in controls under normal daylight increased size was associated with decreased hydration as in the first pot test.

II. Preliminary observations using the disc-culture method.—It was found that disks punched from leaves and floated on salt solutions may show very large increases in water content, while those floated on water may lose water. This water uptake occurred both on full nutrient solution and on solutions of CaCl_2 . An estimate of the electrolyte concentration in the sap was obtained from conductivity measurements, whereas an estimate of total solute concentrations was obtained from freezing-point determinations. It was found that water uptake

might occur without any change, or even with a decline in conductivity and in exerted a diphasic action, concentrations of 1 : 10,000 inhibiting and high dilution, exhibited a very close relationship with water uptake. It is suggested that salt increases the hydration capacity of leaf proteins in the same way that the hydration capacity of gelatin is increased by salts in its isoelectric region. It is also noted that salt might affect respiration, and that this might in some way influence the hydration capacity of protoplasm.

Anthocyanin pattern in Asiatic cottons, R. A. SILOW and C. P. YU (*Jour. Genet.*, 43 (1942), No. 3, pp. 249-284).—Seven further types of anthocyanin in cotton are described and shown to be controlled by members of an extensive allelomorph system of which 14 members are now known in the cultivated diploid Asiatic species, *Gossypium arboreum* and *G. herbaceum*. All of these new types were found in China, 6 in field material and the seventh as an anomaly in experimental cultures.

Carbohydrate and nitrogen trends in bluebunch wheatgrass, *Agropyron spicatum*, with special reference to grazing influences, S. K. McILVANIE. (U. S. D. A.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 540-557, figs. 8).—Analytical data are presented for plants collected at 2-week intervals from snow disappearance to late fall in a fully developed protected bunchgrass area. Available carbohydrate reserves were stored in the lower internodes in percentage amounts nearly equal to root reserves. Peripheral expansion of the bunch resulted partially from shoot and adventitious root production from the lower nodes. The 7-in. height stage coincided with minimum carbohydrates in the roots and minimum C:N ratio in the plant, and this point is considered most vulnerable in the seasonal development of the species. The appearance of the flower stalks marked the beginning of highest total carbohydrate content in the herbage, which was sustained about a month and then declined rapidly during fall curing and secondary growth. A 2-mo. lag in maximum carbohydrate stores occurred in the herbage and roots, with the latter taking place last. Total N content in the roots was depleted in the vegetative stage to 53 percent of that at the formative stage, and a 70-percent depletion of carbohydrates occurred at the normal minimum. Greatest relative amounts of reducing sugars were associated with rapid vegetative growth, of sucrose with differentiation, and of reserve polysaccharides with a brief rest period prior to secondary growth. The maximum total herbage N content occurred at the close of the vegetative stage and declined to about 70 percent (fresh weight) of this value by the time the first flower stalks appeared. Clipping to crown level at 2-week intervals during 8 weeks of the vegetative stage produced the following changes in the clipped as compared with the unclipped plants: 50 percent less total carbohydrates in the roots and 72 percent less in the herbage; 22 percent more total N in the roots and 53 percent less in the herbage; C:N ratios of 1.27 in the roots, and 1.18 in the herbage of the controls, and of 0.57 and of 0.63, respectively, in the clipped plants. Amide N showed no marked difference. There are 22 references.

Increased irritability in *Nitella* due to guanidine, W. J. V. OSTERHOUT (*Jour. Gen. Physiol.*, 26 (1942), No. 1, pp. 65-73, figs. 8).—Guanidine applied to *Nitella* may lower the threshold of e. m. f. required to produce electrical stimulation and may give rise to trains of action currents. Its effect thus appears somewhat similar to that noted for animals. Rapid action currents are produced as well as "square topped" action curves and transitional forms. These effects may be due in part to increased protoplasmic conductivity produced by guanidine.

Influence of sulfanilamide and derivatives on growth of *Lupinus albus*, D. I. MACHT (*Plant Physiol.*, 17 (1942), No. 4, pp. 671-676).—On testing sulf-

anilamide and six of its derivatives, hydroponic solutions containing them exerted a diphasic action, concentrations of 1:10,000 inhibiting and high dilutions of 1:250,000 stimulating root growth. Blood sera of rabbits and man after administration of the sulfa drugs were no more poisonous than normal blood sera and were usually less so. Phytopharmacological examination of such sera affords a convenient method of differentiating true pemphigus from pemphigoid manifestations of the skin produced by the sulfa drugs.

A method of studying the movement of respiratory gases through waxy coatings, R. C. NELSON. (Minn. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 509-514, figs. 2).—A micro-gas analyzer and a technic for testing permeabilities of waxy coatings to respiratory gases are described, using a cucurbit fruit as test object. Tests of three types of waxy coatings (commercial wax and dry-bright wax emulsions and spermaceti wax) indicated that the permeabilities of the coatings to O_2 and CO_2 were critical in determining the success of the treatment, the ideal in this case being a high permeability to O_2 accompanied by low permeability to CO_2 .

Day length and crop yields, M. W. PARKER and H. A. BORTHWICK (*U. S. Dept. Agr., Misc. Pub.* 507 (1942), pp. [2]+22, figs. 15).—In the present emergency and the years ahead, American farmers will be called upon to produce many crops that are new to them, and new crops inevitably bring new production problems. Much waste of effort and invested capital may often be prevented by knowing the areas to which these new crops are adapted. This publication summarizes many of the agricultural applications that have resulted from studies of the influence of day length on plant development and calls attention to the effect of day length on such strategic crops as soybeans, sugar beets, and hemp.

A comparison of the effects of green light and of red light on the simple-leaf development of intact and decapitated bean plants, L. H. FLINT and C. F. MORELAND. (La. State Univ.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 677-681, fig. 1).—Grown under green mercury-incited powder tubes and fluorescent lamps, young bean plants gave satisfactory growth accompanied by starch accumulation in the guard cells without a corresponding development in the mesophyll. Under such conditions the development of simple leaves was slightly greater than in red light obtained from indicated sources. After decapitation there was an abrupt reversal of the responses of the simple leaves to green and red light, accompanied by a reactivation of development under red light.

Improved cytological methods with crystal violet, C. S. SEMMENS (*Stain Technol.*, 17 (1942), No. 4, pp. 147-148).—The author presents details of a method of making up the dye solution which is claimed to lead to better quality preparations which also appear to be quite fast.

Cytological methods for Crepis species, H. A. TORGY. (Univ. Calif.). (*Stain Technol.*, 17 (1942), No. 4, pp. 171-175, figs. 6).

Progress in the standardization of stains: Orcein and litmus, H. J. CONN (*Stain Technol.*, 17 (1942), No. 4, pp. 145-146).

Notes on mounting media, J. L. MOHR and W. WEHLE. (Univ. Calif.). (*Stain Technol.*, 17 (1942), No. 4, pp. 157-160).—Notes on media in place of the green euparal of Gilson and on a plasticizer with clarite.

GENETICS

The handling of chromosomes, C. D. DARLINGTON and L. F. LA COUR (London: George Allen & Unwin, [1942], pp. 165, pls. 16, figs. 7).—This book aims to cover all the steps in handling chromosomes, "from dissecting the first animal or plant to drawing the last diagram," in order to serve teachers, students, and workers in research. The 12 chapters take up origin, scope, and purpose of chromo-

some work, equipment, living chromosomes, bulk fixation, smears and squashes, paraffin methods, staining and mounting, special treatments, the control of mitosis, the control of fertilization, photography, and describing the results. Appendixes give sources of material and standard solutions. References (over 25 pages) and an author-subject index are included.

Production of hybrid corn, G. F. SPRAGUE. (Coop. U. S. D. A.) (*Iowa Sta. Bul.* P48 (1942), pp. 553-582, figs. 18).—The current method of breeding corn, which uses inbred lines and provides complete control of parentage, is described in detail and compared with earlier methods. Comments are made on commercial production of hybrids, improvement of established lines, seed size, use of second generation seed, and on the relative performance records of the older and more recent Iowa Hybrids. Results obtained in the Iowa corn yield test (*E. S. R.*, 87, p. 215) and certification are indicated as criteria of performance and adaptation.

Inheritance and linkage of factors for resistance to two physiologic races of *Cercospora oryzae* in rice, T. C. RYKER and S. J. P. CHILTON. (La. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 9, pp. 836-840, fig. 1).—Resistance in Blue Rose 41 rice to *C. oryzae* race 1 was found to be conditioned by a single dominant factor and the moderate resistance of Blue Rose to race 2 to another single dominant factor. Close linkage exists between resistance to one race of the fungus and susceptibility to the other. In crosses between Blue Rose and Blue Rose 41, a very few plants were obtained in which the linkage seemed to have been broken.

Inheritance of mature plant characters in sorghum, induced by radiation, J. R. QUINBY and R. E. KARPER. (Tex. Expt. Sta.). (*Jour. Hered.*, 33 (1942), No. 9, pp. 323-327, figs. 2).—Nine mature plant characters described, not previously found in sorghum and produced by X-radiation, i. e., zebra stripe *zb*, midget *mi*, yellow leap tip *yl*, fired leaf *fl*, mottled leaf, two red leaf, freckled leaf, and a dwarf, have all been found to be inherited as simple recessives, with deficiencies of recessive homozygotes in several cases. A total of 72 recessive mutations, each deleterious in effect and consisting mostly of common seedling chlorophyll-deficient types, were induced. Favorable material in which to detect a progressive mutation was X-rayed, yet no progressive mutations were produced.

Extent of pathogenicity of hybrids of *Tilletia tritici* and *T. levis*, C. S. HOLTON. (U. S. D. A. and Wash. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 12, pp. 555-563).—Of 50 interspecies and interracial hybrids of *T. tritici* and *T. levis*, about 83 percent of the former perpetuated themselves as contrasted to only 59 percent of the latter. On the other hand, the race hybrids were more productive of new pathogenic segregates than the species hybrids. Some segregates from the various hybrids proved more virulent than the parent races, others were less so, whereas still others were similar in pathogenicity. Entirely new combinations of pathogenicity factors were produced in several of the hybrids, as indicated by their pathogenicity to the Hussar × Hohenheimer variety, which is highly resistant to all known spontaneously occurring races of the wheat bunt. Pathogenicity in *T. tritici* and *T. levis* is genetically controlled and apparently inherited on a multiple-factor basis, but factors for pathogenicity and spore morphology are inherited independently. The selective influence of the host variety is important in establishing new pathogenic types resulting from hybridization.

Inheritance and interrelationship of components of quality, cold resistance, and morphological characters in wheat hybrids, W. W. WORZELLA. (Ind. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 11, pp. 501-522,

figs. 4).—The inheritance and interrelationship of components of quality, cold resistance, and several morphological characters were studied on 600 F_1 and F_2 hybrids and 66 parent rows originating from a triangular cross of American Banner, Trumbull, and Michikof wheats. The mode of inheritance of gluten strength, granulation, carotenoid content, crude protein, kernel weight, test weight, and cold resistance was found to be quantitative and governed by several genetic factors. In hybrids of American Banner \times Trumbull, gluten strength and protein content appeared to be monogenic in inheritance. Single genetic-factor differences governed the inheritance of glume, coleoptile, and straw color. Highly significant interannual correlation coefficients were obtained for the components of quality studied. Very little, if any, association was indicated between cold resistance and components of quality studied. Gluten strength and granulation were inherited independently of the other components of quality. Kernel weight was correlated positively with test weight and both characters negatively with carotenoid content. Genetic linkage was found between the genes for (1) gluten strength and glume color, (2) protein content and kernel color, and (3) coleoptile color and straw color.

The inheritance of reaction of Turkey-Florence-1 \times Oro-1 to race 8 of *Tilletia levis*, C. E. CLAASSEN, O. A. VOGEL, and E. F. GAINES. (Wash. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 8, pp. 687-694, *fig. 1*).—Three crosses consisting of the three possible combinations of Oro-1, (Turkey-Florence)-1, and Sel. 9 of Oro \times Turkey-Florence were studied for the inheritance of reaction to race 8. The F_1 , F_2 , and F_3 of all three crosses and six randomly selected F_4 families of (T-F)-1 \times Oro-1 were tested for bunt reaction during the same year under identical environal conditions. Oro-1 is highly susceptible to L-8 and (T-F)-1 and Sel. 9 are both resistant to L-8. A major and at least one minor factor appeared to account for the segregation of reaction of (T-F)-1 \times Oro-1. These factors for resistance are carried by (T-F)-1. Crosses of Sel. 9 with Oro-1 and (T-F)-1 indicated that Sel. 9 has only the major factor for resistance. The three parents represent three of the four homozygous genotypes possible under the two-factor hypothesis. Two F_4 families appeared to represent the fourth genotype. Segregation of the major factor in conjunction with the minor homozygous resistant factor was apparently attained in an F_4 family. The average percentage class for each of the nine genotypes was calculated from the average percentages of bunt produced by the F_2 plants of the three crosses and by the four homozygous genotypes.

A hereditary variegation in tomatoes, J. W. and M. M. LESLEY. (Calif. Citrus Expt. Sta.). (*Genetics*, 27 (1942), No. 5, pp. 550-560, *figs. 5*).—This variegation, characterized by abnormal pale-green areas occurring on normal leaves and green stems and found to be nontransmissible by the methods ordinarily effective with a virus, is believed to be genetic in nature. The variegation behaved as a dominant character and was, as a rule, inherited maternally. In extreme cases, the variegated plants were entirely unfruitful.

Comparative cytology of sterile intra- and fertile intervarietal tetraploids of *Antirrhinum majus* L., A. H. SPARROW, M. L. RUTTLE, and R. R. NEBEL. (N. Y. State Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 9, pp. 711-715, *figs. 7*).—A comparison of microsporogenesis and the percentage of unaborted pollen in intra- and intervarietal snapdragon tetraploids, showed that sterility in the intravarietal forms is not correlated with the mean number of chromosome associations, nor with a difference in the mean valency per cell, nor with the valency percentage, nor with group associations.

Breeding work toward the development of a timber type of blight-resistant chestnut.—Report for 1941, A. H. GRAVES (*Amer. Jour. Bot.*, 29 (1942), No. 8, pp. 622-626, figs. 3).—This progress report (E. S. R., 87, p. 83) is summarized by the author as follows: "In the F₁ Japanese-American hybrid chestnuts the American parent is incompletely dominant. In order to continue breeding for the desired result, namely, a blight-resistant chestnut of tall erect growth, suitable for a timber tree, the F₁ hybrids are being kept in vigorous condition by a kind of bridge grafting. No definite statement of the genetic situation in the Chinese-American hybrids can yet be made. A situation in the breeding of certain types of tobacco which is similar in some respects to that of the Japanese-American hybrids of chestnut is briefly described. A record of the results of breeding of various chestnut species and hybrids in 1941 is given, including four combinations new to science. It is stated that the possibility of natural variation in the chestnut in the direction of disease resistance should not be ignored, and in this connection a plea is made for native nuts to be sent to the Brooklyn Botanic Garden."

[Abstracts of papers on animal breeding and artificial insemination for presentation at the thirty-fifth annual meetings of the American Society of Animal Production] (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 341-345, 346-347, 348, 349, 351, 358, 358-359, 360).—Brief summaries are presented of papers giving the results of the following studies:

Analysis of a Breeding Program—Growth, Production, and Health, by J. W. Bartlett, S. Margolin, and O. L. Lepard (p. 341) (N. J. Expt. Stas.); Effect of Progeny Testing on Progress From Selection Within Closed Herds, by G. E. Dickerson and L. N. Hazel (p. 342), and Selection for Growth Rate and Productivity in Closed Herds of Swine, by G. E. Dickerson and L. N. Hazel (p. 342) (both U. S. D. A. and Nebr. Sta.); Results to be Expected From Selection on a Family Basis, by J. L. Lush (pp. 342-343), and The Breeding Structure of the Purchured Aberdeen Angus Cattle Population in the United States From 1900 to 1939, by H. H. Stonaker, J. C. Holbert, and J. L. Lush (p. 343) (both Iowa State Col.); Experimental Attempts to Modify the Sex Ratio in Rabbits and Pigs, by H. C. McPhee and O. N. Eaton (p. 343) (U. S. D. A.); Experimental Modification of Estrual Phenomena in Ewes, by E. J. Warwick and L. E. Casida (pp. 343-344), and The Relation of Certain Fundamentals of Sperm Metabolism to the Problem of Semen Storage for Artificial Insemination, by H. A. Lardy and P. H. Phillips (p. 344) (both Univ. Wis.); Fertility in Range Beef Cattle, by A. L. Baker and J. R. Quesenberry (pp. 344-345); Differences in Performance Between Sexes in Offspring of Beef Bulls, by B. Knapp, Jr., and R. W. Phillips (pp. 346-347), and Breeding Methods for the Production of Hybrid Beef Cattle Along the Gulf Coast, by A. O. Rhoad (p. 347) (all U. S. D. A.); The Value of Short-Time Records for Culling and for Progeny Testing of Dairy Cattle, by C. W. Kennedy and D. M. Seath (p. 348) (La. State Univ.); A Dam-Daughter Comparison of Daughters of Holstein-Friesian Sires Proved in D. H. I. A. Work, by R. P. Reece and J. W. Bartlett (p. 349) (N. J. Stas.); A Genetic Analysis of Stakes Winning and Poor Performing Thoroughbreds, by D. G. Steele (p. 351) (Univ. Ky.); The Effect of Sex on the Development of the Pig (E. S. R., 87, p. 657)—III, Differences in Growth Rate Between Males and Females by Lines of Breeding, by R. E. Comstock, L. M. Winters, and J. N. Cummings (p. 358) (Minn. Sta.); Genetic and Environmental Correlations Between the Growth Rates of Pigs at Different Ages, by L. N. Hazel, M. L. Baker, and C. F. Reinmiller (pp. 358-359) (Nebr. Sta. and U. S. D. A.); and The Development of an Inbred Line of Swine From a Crossbred Foundation, by L. M. Winters, R. E. Comstock, and D. L. Dailey (p. 360) (Minn. Sta.).

[**Physiological and genetic studies with livestock by the Bureau of Animal Industry**]. (Partly coop. Mont., Mo., Idaho, and Miss. Expt. Stas.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1942, pp. 5, 6, 8-9, 10-11, 12-13, 15, 16-17).—In continuation of previous studies (*E. S. R.*, 86, p. 609), there are included progress reports on investigations of artificial insemination of cattle, sheep, and swine; failure to control sex ratios in rabbits and swine; progeny performance and effects of environment on beef cows; ewes of different breeds for lamb production; index of fleece for selecting breeding sheep; elimination of skin folds and improvement of lamb weight in Rambouillets; inbreeding sheep; record of performance studies with swine breeds; the variance of pig weights and size of pigs in different litters; breeding results with sows; improvement of swine through application of breeding methods; physiology of reproduction studies with mares, stallions, jacks, and jennets; crossing breeds of poultry for egg production; relation of molting and maturity to viability and production in poultry; influence of light on egg production; and mortality and diseases in poultry.

[**Breeding and insemination of livestock by the Georgia Station**] (*Georgia Sta. Rpt.* 1942, pp. 45, 49-50, fig. 1).—There are reported studies of artificial insemination and the transportation of semen for dairy cattle production, the effects of crossing different breeds of rams on native and grade ewes, and sheep breeding for Georgia conditions.

A new type of recessive achondroplasia in cattle, P. W. GREGORY, S. W. MEAD, and W. M. REGAN. (*Univ. Calif.*). (*Jour. Hered.*, 33 (1942), No. 9, pp. 317-322, figs. 2).—A sublethal type of achondroplasia occurred in Jersey cattle in which inbreeding was practiced. The condition was variable. There was a short, broad head, frequently with cleft palate and other associated abnormalities. In mating of carrier bulls to daughters of heterozygous bulls there were produced 9 defective and 49 normal calves without regard to sex. The defect was inherited as a monofactorial autosomal recessive. Two recessive types of achondroplasia in cattle seem to exist, i. e., the Telemark type and the one herein reported.

Study of wool quality as the basis of individual selection in breeding of Deccan sheep, E. J. BRUEN, S. S. KHOT, and A. K. DESHPANDE (*Indian Jour. Vet. Sci. and Anim. Husb.*, 11 (1941), No. 3, pp. 181-206, pls. 4, figs. 8).—Four types of wool were sheared from six locations on Deccan sheep. The means and variation of the fibers of each grade were ascertained. Among those tested there were included over 6,000 fibers in the fine and strong groups. The percentages of the different types from the different regions of the fleece are shown, and analysis of variance was included to bring out the effects of different breeds on the grease and density.

Experimental design for testing inbred lines of swine, G. E. DICKERSON. (*U. S. D. A.*). (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 326-341, fig. 1).—A statistical analysis is presented of the variance theoretically expected in crosses between unrelated and related inbred lines. "Additive genetic differences between unrelated inbred lines are expected to average $\sqrt{2}$ times as large as those between unrelated first generation line crosses, 2 times those between top crosses of unrelated inbred lines, and $\sqrt{8}$ times those in comparisons of individual top crosses of unrelated lines with outbred stock." The importance of genetic differences in mothering ability in inbred and line crosses is noted. The average number of replications required to give statistical significance to 180-day weights and productivity between two unrelated inbred lines is given for different degrees of inbreeding and varying numbers of sires per line and litters per sire. As the homozygosity of inbred lines increases, average differences between inbred lines

approach a maximum, which is $\sqrt{2}$ times as large as average genetic differences between unrelated individuals in an outbred population, when all gene effects combine additively. The comparable maxima are 1 for line crosses, $\sqrt{0.5}$ for top crosses, and 0.5 for comparison of individual top crosses with outbred stock. The differences between groups would increase with nonadditive gene effects and increased inbreeding. Differences between groups were smaller as a result of selection within the groups. The average numbers of animals necessary for statistical significance of expected intraherd and intra-season differences between groups at the U. S. Regional Swine Breeding Laboratory were suggested.

The individuality of sows in regard to size of litters, C. HALLQVIST (*Hereditas*, 28 (1942), No. 1-2, pp. 127-135).—The number of pigs alive after 6 weeks proved to be more effective as a means of selection than the number born, but the best results were obtained when due regard was paid to both. The data were based on a variance analysis of litter sizes of total and live pigs at birth and alive at weekly intervals up to 6 weeks in 596 litters produced by 117 sows having 3-10 litters each. The average litter size was 10.6 and was separated into groups above and below this amount, having averages of 11.6 and 6.8 pigs, respectively. There was a difference of 1 in litter size of the latter group which agreed closely with 0.96, which was calculated from the intraclass correlation of 0.20 and the difference between the early litter sizes. By elimination of the sows having less than the average sized first litters, subsequent litter size was increased 0.5 or somewhat less than 5 percent. Further analysis showed that differences were most pronounced in number of pigs born, but consideration of the number alive at 6 weeks proved a helpful addition. Such selection resulted in an increase of 5.8 percent in the litter size and 3.6 percent in the weight of subsequent litters at weaning.

Inherited macrocytic anaemias in the house mouse. II, Dominance relationships, H. GRÜNEBERG (*Jour. Genetics*, 43 (1942), No. 3, pp. 285-293).—In further study of the relation of the macrocytic anemia genes W and W^v in the mouse (E. S. R., 82, p. 465) it appeared that W had no measurable effect on the blood of the heterozygote $W/+$ regardless of the amount of variegation. On the other hand, mice heterozygous or homozygous for W^v showed reduced numbers of erythrocytes per cubic millimeter of blood.

Predetermination of sex, J. W. GOWEN and R. H. NELSON. (Iowa Expt. Sta.). (*Science*, 96 (1942), No. 2503, pp. 558-559).—Genotypes genetically controlled have been established in *Drosophila melanogaster* for sex ratios all males in over 500 matings in eight generations. No failures in finding male-producing genotypes occurred. Means of sex control are thus established.

The genetics of the grouse locust *Tettigidea parvipennis* Harris, C. M. GOOD, JR. (Kans. State Col.). (*Kans. Acad. Sci. Trans.*, 44 (1941), pp. 234-237).—Known hereditary factors include 19 in the species *T. parvipennis*, including 16 color pattern factors, 1 for long and short wings, a lethal, and a wild type gene. There are 10 factors on one chromosome without crossing over. Genetic factors were located on at least three of the six chromosomes.

Development of strains of general purpose breeds possessing high egg production and early feathering tendencies, D. C. WARREN (*Kansas Sta. Bion. Rpt.* 1941-42, p. 47).—The development of strains for early feathering in White and Barred Plymouth Rocks and Rhode Island Reds by crossing with New Hampshires.

Crosses between inbred lines of the domestic fowl, A. J. G. MAW. (Iowa Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 548-553).—The method of breeding known as top crossing gave better results than crossing inbred lines with relationship between them. As the relationship between the parents

increased from 0 to 60.5 percent, chick mortality increased and body growth and egg production decreased. The effect of different methods of breeding was ascertained from the progeny of inbreds, single, double, and triple crosses and top crosses with the descendants of inbreds of Waters and Lambert (E. S. R., 75, p. 763) and an English inbred line. Single-Comb White Leghorns served as controls. There were from 76 to 1,290 chicks produced by the different methods of breeding.

An inherited micromelia in the domestic fowl, V. S. ASMUNDSON. (Univ. Calif.). (*Jour. Hered.*, 33 (1942), No. 9, pp. 328-330, fig. 1).—In connection with a study of embryos failing to hatch, it was suggested that micromelic embryos were due to a double autosomal recessive effect since in 763 chicks and embryos the abnormalities occurred at the rate of 15 normal to 1 abnormal. Micromelic embryos had much shortened and thickened extremities and deformed beaks. The long bones of micromelic embryos were reduced in weight and were higher in ash than normals. The wing bones of chicks after 22 days' incubation were lower in ash than the leg bones.

Growth of turkeys.—II, Relative growth of the tarsometatarsus, V. S. ASMUNDSON and I. M. LERNER. (Univ. Calif.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 505-510, fig. 1).—Continuing this series (E. S. R., 82, p. 668), statistical treatment of body weights and shank length at approximately 4-week intervals up to 32 weeks of age of 12 groups of turkeys comprising three Bronze strains, and five other varieties and crosses between them, indicated that general size factors controlled growth from 4 to 16 weeks of age. At later periods shank length increases were relatively small. Comparatively large broadbreasted Bronze turkeys had relatively shorter legs than smaller strains. Differences in the rate of growth had a greater influence on the proportion of the length of the shank to body weight at 32 weeks of age than differences in the rate of growth of the shank. These conclusions were derived from calculation of constants of heterauxesis and allomorphosis at the different ages (E. S. R., 85, p. 383). Heterauxesis refers to the relation of the rate of growth of the tarsometatarsus and body, whereas allomorphosis refers to the relation between the length of the shank and total body weight.

A preliminary study of the effect of sunlight, dubbing, and fractionated anterior pituitary extract upon growth, endocrine glands, and sexual capacity of Single Comb White Leghorn cockerels, N. NIKOLAICZUK and W. A. MAW. (*Poultry Sci.*, 21 (1942), No. 6, pp. 483-496, figs. 2).—The effect of sunlight and dubbing and the influence of a fractionated pituitary extract on growth, weights of the gonads and other endocrines, and spermatogenesis were studied in 8 groups of 10 Single-Comb White Leghorn chicks each. One half had access to sunporches and the other half received no direct sunlight. Two lots in each group were dubbed at 4 weeks of age and 2 lots received the pituitary extract on alternate days from 11 to 30 weeks of age. Half were killed at 23 and the balance at 30 weeks for determination of the weights of the endocrines. Histological study was made of the testes from 1 bird of each lot. Sunlight had no effect on the development of the body size. Thyroid and adrenal weights were reduced and the pituitary and testes weights and breeding potentialities were increased by sunlight. Dubbing retarded early development of the endocrines but stimulated their final development to greater weights than normal. Dubbing caused an early deceleration of growth rate, followed by compensatory development toward maturity so that dubbed birds showed a slightly superior body size at 30 weeks of age, although a slightly inferior spermatozoa count. Injection of pituitary extracts gave no evidence of a modified growth impulse but there was a higher spermatozoa count. Microphotographs of the testes of single birds from each of the lots are presented.

Time of pigment deposition in brown shelled hen eggs and in turkey eggs, D. C. WARREN and R. M. CONRAD. (Kans. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 515-520, figs. 3).—Although some of the pigment of brown shelled hens' eggs was being deposited throughout the time of shell formation, it appeared from prematurely expelled eggs that 50-74 percent of the shell pigment was added in the last 5 hr. before oviposition. Turkey eggs acquired the specks at or near the time of laying. The pigment deposited in the shell 3, 6, 9, and 12 hr. after eggshell formation was first detected in the oviduct was ascertained by chemical methods and densitometer readings of photographic plates. In conducting the work the bird was anesthetized with nembutal and the egg expelled by pressure.

Masculine copulatory behavior in intact and castrated female rats, F. A. BEACH and P. RASQUIN (*Endocrinology*, 31 (1942), No. 4, pp. 393-409, figs. 5).—Studies of the responses of normal and ovariectomized ♀s to receptive ♀s and ♂s showed that the masculine sexual reactions of the ♀ rat are not dependent on ovarian hormones.

Oogenesis and its relation to the oestrous cycle in the adult mouse, W. S. BULLOUGH (*Jour. Endocrinol.*, 3 (1942), No. 2, pp. 141-149, pl. 1, figs. 2).—Study of the number of mitoses in the germinal epithelium of the ovary at different stages of the oestrous cycle in 40 mice showed that mitotic activity was least in dioestrus with gradual rises to reach high levels in the post-ovulation oestrus. Mitoses of the germinal epithelial cells, the meiosis of the primary oocyte, and mitoses of the secondary oocyte all take place in the post-ovulation oestrous period, and it is suggested that their occurrence may be related to a high oestrogen concentration in the region.

A comparison of the effects of two gonadotropic hormones on immature fowl gonads, E. H. HERRICK and C. H. LOCKHART. (Kans. State Col.). (*Kans. Acad. Sci. Trans.*, 44 (1941), pp. 418-419).—Intramuscular injection of Antultrin and Antultrin-S into immature ♀ chicks caused a greater development of ovarian follicles than was found in uninjected controls. There was no significant effect of such treatment on the development of the ♂ gonads.

Seasonal variation in semen quality of the dairy bull, R. E. FERR, F. N. ANDREWS, and J. H. HILLOX. (Ind. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 9, pp. 815-826, figs. 5).—All factors studied, which included volume, concentration, motility, sperm per ejaculate, sperm survival, and abnormal sperm, showed spring semen to be superior except in pH, which did not vary. The summer ejaculates were poorest and, semen produced during the fall and winter months did not vary significantly from the mean. The study was based on 879 ejaculates from nine bulls representing the four major dairy breeds and variance analysis of semen from four young bulls collected weekly. A bibliography on sperm character and artificial insemination in cattle is presented.

Relation of mammogenic lobule-alveolar growth factor of the anterior pituitary to other anterior pituitary hormones, J. P. MIXNER, A. J. BERGMAN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 31 (1942), No. 4, pp. 461-466).—Comparative assays of a number of pituitary hormones for the mammogenic growth factor indicated that it was protein in nature but was not identical with the lactogenic, thyrotropic, or gonadotropic hormones. These studies were carried on with ovariectomized ♀ mice (E. S. R., 87, p. 845). Some extracts high in these hormones did not give positive lobule alveolar responses.

Dilutors for stallion and jack semen, V. R. BERLINER. (Miss. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 314-319).—A dilutor for jack and stallion semen for use in artificial insemination was prepared by dissolving a ½-oz. gelatin capsule containing 5.76 gm. of glucose and 0.67 gm. of Rochelle salt in

100 cc. of water and adding one egg yolk free from its membrane and other materials. This dilutor produced 90 percent sperm activity after 48 hr. in 30 samples, and 86 percent pregnancies in 22 mares. Such a dilutor should be pasteurized and used at a temperature to avoid shock, and seemed especially good for storage with gradual cooling to about 0° C. (E. S. R., 86, p. 316).

The hydrogen-ion concentration of the semen of the bull, J. ANDERSON (*Jour. Agr. Sci. [England]*, 32 (1942), No. 3, pp. 298-307, figs. 5).—The mean pH of 221 ejaculates of semen collected from normal bulls by the use of the artificial vagina was 6.73 ± 0.020 . Individual differences in the variance between 11 bulls were significant. Where there was a higher semen acidity a better motility in storage was maintained. Alkalinity induced a decrease in activity during storage periods.

Studies in fertility in sheep.—II, Seminal changes affecting fertility in rams, R. M. C. GUNN, R. N. SANDERS, and W. GRANGER (*Austral. Council Sci. and Indus. Res. Bul.* 184 (1942), pp. 140, pls. 15, figs. 39).—Artificially hot dry atmospheres, to which 10 rams were exposed for varying intervals up to 27 days with daily electrical ejaculations (E. S. R., 75, p. 822), were found to cause seminal degeneration varying in extent with the height of the temperature and the duration of the treatment. When the rams were subjected to temperatures higher and humidity lower than the paddock, degeneration of their semen occurred in all cases in a few days and was progressive at times even after the exposure was discontinued. Several treatments of shorter intervals led to the conclusion that exposures to hot temperatures of different intervals resulted in degeneration of the semen, which corresponded to that observed in rams subjected to hotter and colder districts of Australia. A numerical expression of semen characters based on activity, reaction, and morphology of the sperm is presented. A survey of the conditions of ram semen from different regions showed that seminal degeneration was also associated with conditions causing fever, arsenic dipping, and nutritional deficiencies. It was observed that seminal degeneration occurred about 6 mo. after the greenness of pasture was lost and about 4 weeks after the beginning of the sustained maximum temperature above 90° F. Regeneration was not complete until about 2 mo. after the unfavorable condition ceased.

Effects of oestrogen (stilboestrol) on the sperm production of adult rams, M. C. CHIANG (*Jour. Endocrinol.*, 3 (1942), No. 2, pp. 192-202, figs. 4).—Study of semen production by two adult Suffolk rams from which there was absorption of implanted stilboestrol showed that the implants caused a definite increase in sperm production and no decrease in sperm quality, as has been reported for the rat by Ringo.¹ Although ejaculations were studied 71-90 days after the administration of stilboestrol, there was no definite sign of ill effects. Sperm were ejaculated twice each day for from 50 to 100 days by each of the two rams. Study was made of the samples for amount of normal and abnormal sperm and the average reaction time of the rams, as well as the keeping quality and oxygen consumption of the spermatozoa. In two rams there were implanted from 10 to 40 stilboestrol tablets with removal of the remaining material at later dates.

A study of estrus and ovulation in the mare, J. N. CUMMINGS. (Mont. Expt. Sta.). (*Jour. Anim. Sci.*, 1 (1942), No. 4, pp. 309-313).—Data in addition to those of Andrews and McKenzie (E. S. R., 86, p. 178) are reported on oestrus and ovulation in 16 mares, all except 2 with foal. In the 40 oestrous periods observed there was an average of 11.31 days from foaling to the first signs of oestrus ascertained with a teaser stallion. Ovulation determined by rectal palpa-

¹ Anat. Rec., 72 (1938), No. 4, Sup., pp. 118-119.

tion occurred an average of 17.8 days after foaling. The average duration of all oestral periods was about 5 days. The length of oestrus and dioestrus, the time of ovulation, or the type of oestrus had little predictive value in succeeding cycles when the observations were based on a single cycle. There was more variation in foaling oestrus than in subsequent oestral periods.

Hormonal augmentation of fertility in sheep.—I, **Induction of ovulation, superovulation, and heat in sheep**, J. HAMMOND, JR., J. HAMMOND, and A. S. PARKES (*Jour. Agr. Sci. [England]*, 32 (1942), No. 3, pp. 308-323).—Detailed data are reported on the condition of the ovaries, ova production, and corpora lutea of 112 ewes slaughtered at various intervals following injection with extracts of anterior pituitary, pregnant mare serum, human pregnancy urine, and synthetic gonadotropins during oestrus and anoestrus. Extracts of horse pituitary gland, pregnant mare serum, and pregnant urine produced ovulation in anoestrous sheep, but the number of ova shed was independent of the dosage. Horse pituitary extracts and pregnant mare serum caused sexual receptivity only in animals having regressing corpora lutea. The presence of an active corpus luteum usually suppressed both ovulation and heat, but horse pituitary extract a few days before the corpus luteum was due to regress, caused superovulation at the next heat. The number of ova washed from the vagina of animals slaughtered are reported.

Isolation of adrenocorticotrophic hormone from sheep pituitaries, C. H. LI, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Science*, 96 (1942), No. 2498, p. 450).—The methods for separation of adrenotropic hormone from sheep pituitaries are described, including description of two methods of biological standardization based on a repair of the adrenal cortex of the hypophysectomized immature ♀ rat and the maintenance of the adrenal cortex of the hypophysectomized ♂ rat.

Relation of thyroid to mammary gland structure in the rat with special reference to the male, J. F. SMITHCORS and S. L. LEONARD. (Cornell Univ.). (*Endocrinology*, 31 (1942), No. 4, pp. 454-460, figs. 11).—Thyroidectomy at 25 days of age of immature normal and castrated ♂ rats caused inhibition of mammary duct growth and stimulation of alveolar development, confirming previous findings (E. S. R., 85, p. 469). It was impossible to tell glands from thyroidectomized animals treated with oestrogen from glands of such animals treated with male hormone.

FIELD CROPS

[**Field crops research in the Bureau of Plant Industry**]. (Partly coop. State expt. stas. et al.). (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1942, pp. 5-9, 9-10, 12-13, 16-17, 24, 25, 26, 27).—Accomplishments and current results are reported by M. A. McCall, H. W. Barre, O. S. Aamodt, J. R. Magness, E. W. Brandes, and W. W. Garner from breeding work with corn, wheat, oats, rice, grain sorghum, cotton, alfalfa, red clover and sweetclover, soybeans, bromegrass, potatoes, sorgo for sugar and alcohol, sugarcane, and sugar beets. The improved varieties included Comanche and Pawnee, new hard red winter wheats high-yielding and resistant to leaf rust (Pawnee is also moderately resistant to the Great Plains strain of hessian fly); expansion of areas growing Pilot and Rival spring wheats resistant to leaf rust; Pioneer and Wintok winter-resistant oats and Rangler oats resistant to crown rust and smut; disease-resistant rice; new grain sorghums saving harvest labor and resistant to chinch bugs; improved American Egyptian cotton, two new strains of sea-island stapling 1½-1¾ in., and better long-staple upland cottons; A-136, a wilt-resistant alfalfa; Arkan, Magnolia, Boone, and Gibson soybeans; potato varieties

combining resistance to diseases and insects with high yield and good market and cooking quality; C. P. 33/243, a disease-tolerant sugarcane; and U. S. 215×216, an improved leaf spot resistant sugar beet. Improvements in cultural practices were treatment of cottonseed with Sperguson replacing mercurial and other chemical dusts and reginning cottonseed to save chemicals and obtain linters; need of more K for cotton in rotation with peanuts and less N in rotation with soybeans; production, harvesting, and retting practices for hemp; practicing a system of deferred and rotation grazing to improve pastures damaged by overgrazing or drought; superiority of crested wheatgrass to native range and other grasses in pasture experiments in the northern Great Plains; mixing artificial cultures with cottonseed meal or sand for inoculation of clovers in the Southeast; satisfactory replacement of superphosphate in potato fertilizers with phosphates prepared without use of sulfuric acid; better sugar beet seed yields from proper spacings; and better crops of tobacco after natural weed fallow. Other research considered waxy starches (replacing tapioca) from corn, sorghum, and other cereals; tests of oats for high vitamin and high chlorophyll foods and feeds; establishment of a manila hemp fiber industry in Central America; plantings of sisal and henequen in Haiti, Cuba, and Mexico; and planting of sorgho in Louisiana for production of high-proof alcohol for explosives.

[Field crops work in Alaska, 1938-41] (*Alaska Stas. Prog. Rpt. 1938-41*, pp. 8-11, 13-14, 21-26, 29-31, 33-36, figs. 3).—Experiments reported on again (E. S. R., 81, p. 362) included breeding work with wheat and barley; variety tests with potatoes, alfalfa, clover, sweetclover, and other forage legumes and grasses; observations on legumes and grasses for winter hardiness; cultural and fertilizer tests with grasses and legumes (E. S. R., 88, p. 43), and potatoes; effects of different fertilizers on chemical constituents of potatoes and of treble superphosphate on their growth and maturity under field conditions; storage tests with potatoes; investigation of the hardiness, growth habit, and seed production and improvement of yellow-flowered alfalfa (*Medicago falcata*); and crop rotations. The average acre yields and production costs of wheat, oats, and barley, and oat-pea hay and silage are also recorded.

[Field crops research by the Georgia Station]. (Partly coop. U. S. D. A. and Ga. Coastal Plain Expt. Sta.). (*Georgia Sta. Rpt. 1942*, pp. 12-23, 29-41, 51-57, 62-63, 69-70, 75-76, 92-93, 94, 98-99, 99-101, 102, figs. 4).—Work with field crops (E. S. R., 86, p. 772) at the station, the Georgia Mountain Substation, and outlying fields included breeding work with cotton, wheat, oats, and peanuts; variety tests with corn, cotton, wheat, soybeans, peanuts, castor-beans, and potatoes; comparative yields of small grains variously fertilized; fertilizer experiments with cotton, corn, oats, barley, wheat, vetch, cowpeas, Austrian Winter peas, Alyceclover, and pastures; regional cotton variety-wilt-tests; sources of P for cotton with and without gypsum; minor elements for cotton limed to different pH levels; nutrition of cotton, comparing ammonium and nitrate N with added trace elements; tests comparing treated and untreated anthracnose-infested cottonseed; planting tests and root knot studies with soybeans; certification work with potatoes; variety, planting, spacing, and curing tests with sweetpotatoes; and pasture research, dealing with fertilizers, limestone, and irrigation for Bermuda-lespedeza pasture production, limestone on clover yields, single v. split applications of N for Bermuda grass and Bermuda grass plant studies concerned with distribution of roots and rhizomes at different soil depths and effects of scarification of Bermuda sod. Additional pasture studies at the Georgia Mountain Substation considered pasture plants, clover varieties, response of upland and bottom land pastures to fertilizers, value of supplemental irrigation, and effects of various treatments on yield and flora changes.

[**Field crops research in Kansas, 1941-42**]. (Partly coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1941-42*, pp. 14, 17-19, 20-26, 27-28, 30-31, 63-64, 65-66, 66-67, 68).—Results from experiments with field crops and related agronomic studies (E. S. R., 85, p. 40) at the station, substations, and soil and crop experimental fields, reported on by R. W. Hoecker, S. W. Decker, A. B. Erhart, R. I. Throckmorton, F. E. Davidson, C. R. Porter, E. Abmeyer, W. F. Pickett, G. A. Dean, H. H. Laude, L. P. Reitz, E. G. Heyne, E. G. Bayfield, J. W. Zahnley, R. W. Jugenheimer, C. O. Grandfield, K. L. Anderson, A. L. Clapp, J. A. Johnson, Jr., J. C. Frazier, E. C. Miller, A. F. Swanson, A. L. Hallsted, L. E. Wenger, F. L. Timmons, L. C. Aicher, H. J. Haas, J. B. Kuska, E. H. Coles, and T. B. Stinson, included varietal tests with winter wheat, corn and hybrids, oats, barley, grain sorghum, sorgo, flax, soybeans, cowpeas, alfalfa for yield and wilt resistance, sweetclover, and miscellaneous grasses and legumes mixtures; breeding work with corn, wheat, oats, barley, grain sorghum, sorgo, flax, alfalfa, buffalo grass, and pasture grasses; sorghum crosses for waxy endosperm grain; inheritance studies of factors affecting quality of wheat; production tests with castor-bean varieties, perilla, sesame, and safflower; cultural (including planting) experiments with wheat, corn, barley, grain sorghum, and soybeans; storage, fertilizer, and variety experiments with potatoes; crop rotations; basin, ordinary, and contour listing for wheat and milo; fertilizer tests with soybeans, wheat, oats, corn, and sweetclover; vitamin B₁ treatment on corn; studies of heat, light, and drought tolerance in corn, sorghum, and spring wheat; study of the relation between the environment of the wheat crop and growth and yield; alfalfa investigations, including correlation of root reserve storage with other physiological processes, time of cutting, and seed production, and varietal improvement, especially for resistance to wilt and black stem; pasture research, including management of livestock, effects of fertilizers and burning on bluestem pastures, tests with mixtures of cultivated grasses, effects of mowing on buffalo and blue grama stands, winter wheat and Sudan grass as a supplement to native grass for pasture, effects of time and method of seeding upon stands of native grasses, and seed production and germination studies with buffalo grass; weed control studies, including methods of killing bindweed with chlorate and other chemicals, cultivation, smother crops, and other practices, physiological study of bindweed in relation to its control, including development of underground roots and reserves and their modification by cultivation, penetration of herbicides, and seed viability; survey of pricklypear near Hays; and study of the root system of hoary cress.

[**Farm crops research in Mississippi**] (*Miss. Farm Res. [Mississippi Sta.], 5 (1942), No. 12, pp. 1-2, 7, 8, fig. 1*).—Experimentation with field crops is reported in articles entitled Louisiana [Corn] Hybrids Lead in Tests at 7 Locations, but Varieties Not Far Behind (p. 1); Hormone Treatments Showed No Benefit in Tests on Corn, Cotton, and Soybeans, by O. A. Leonard, J. A. Pinckard, J. F. O'Kelly, S. G. Brain, A. S. Ramsey, and J. W. Neely (pp. 2, 7); Delta Trials Result in High Corn Yields by Better Hybrids and Adapted Varieties, by P. W. Gull (p. 8); Hairy Vetch Yield Increased by Use of Lime, Phosphate, by C. D. Hoover (p. 8); and Rate and Analysis of Fertilizer for Maximum of Profit [From Cotton], by R. Coleman (p. 8).

[**Field crops research in Montana in wartime**]. (Partly coop. U. S. D. A.). (*Montana Sta. [Bien.] Rpt. 1941-42, pp. 12-14, 26-27, 28-29, 31-32, 42-43, 44-46, 50, 51-53, 54, 54-57*).—Agronomic research at the station and substations (E. S. R., 84, p. 612) providing contributions useful in wartime and reported on by A. H. Post, W. O. Whitcomb, F. M. Harrington, W. E. Pollinger, D. Hansen, D. V. Kopland, R. M. Williams, and F. S. Willson comprised breeding work with wheat, barley, oats, corn, flax, and grasses; variety tests with corn, wheat,

oats, barley, fiber flax, and miscellaneous forage grasses; trials with mustard; fertilizer trials with potatoes, including tests with B, wheat, and sugar beets; cultural (including planting) tests with crested wheatgrass and other forage grasses, alfalfa, wheat, oats, barley, rye, corn, flax, and potatoes; crop rotations on dry land and under irrigation and variously fertilized; maximum crop-producing capacity of soils; grazing studies with crested wheatgrass, Alta fescue, and alfalfa; seeds mixtures for irrigated pasture; pasturing annual crops with hogs; and regrassing abandoned cropland, and other uses of crested wheatgrass. Research and control activities of the grain inspection laboratory with agricultural seeds, and its grading and protein tests with wheat are also reviewed briefly.

Effect of vitamin B₁ on field crops grown on several North Carolina soils. W. W. WOODHOUSE, JR., and H. D. MORRIS. (N. C. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 322-326).—Application of B₁ apparently was not effective in increasing yields of corn and cotton on any of six soils studied, except on extremely poor Durham sandy loam, and its addition to corn and cotton fertilizers in the area is not advised.

[Field crops experiments in Oregon]. (Partly coop. U. S. D. A.). (*Oregon Sta. Bul.* 401 (1941), pp. 10, 45-47, 48-50, 51-54, 56-58, 59-60, figs. 5).—Progress results and accomplishments are reported on from agronomic studies (E. S. R., 82, p. 325) at the station and substations, including breeding work with wheat, oats, barley, potatoes, and grasses and legumes; crop rotations; effect on nodule bacteria of mixing Ceresan-treated oats with inoculated vetch seed; seed production of grasses, sugar beets, alfalfa, and cover crops; tillage experiments and rotations with wheat; sowing of Fairway crested wheatgrass and tall meadow oatgrass with alfalfa to keep out "cheat" grass; and experiments on control of weeds in grain, Canada thistle, creeping velvet grass, and other noxious weeds. Superior varieties or strains of wheat, barley, oats, corn, alfalfa, clover, vetch, sweetclover, grasses, and potatoes developed or introduced by the station are mentioned.

[Field crops work in Pennsylvania] (*Pennsylvania Sta. Bul.* 429 (1942), pp. 10-11, 24-25, 34, figs. 2).—Reports of progress are made from research concerned with tests of corn hybrids and open-pollinated varieties, by C. F. Noll; yield and winter injury tests with alfalfa varieties, breeding work with red clover, and seed production tests with strains of grasses, clovers, and other legumes, all by H. B. Musser; trials of soybean varieties, by C. J. Irvin; tests of blight-resistant potato strains, by W. R. Mills; proper stages for combining wheat, by C. O. Cromer; drying grass seed with a cheap, efficient device employing infrared radiant energy, by J. E. Nicholas; burning red fescue tops to control "silvertop" and control of hot-weather grass disease with chloranil, both by C. C. Wernham; importance of white clover in bluegrass pasture, by J. W. White; and sources of K for cigar-leaf tobacco fertilizers, by O. E. Street.

[Crops work in Puerto Rico in 1941] (*Puerto Rico Sta. Rpt.* 1941, pp. 14-15, 17).—Variety tests with sugarcane on two soil types, by A. G. Kevorkian and E. Hernández Medina; a trial of the promising lawngrass Transvaal dogtoothgrass (*Cynodon transvaalensis*), by C. L. Horn; and increase of seed of Seminole soybeans, by W. K. Bailey are reported on briefly.

[Farm crops and range research] (*Farm and Home Sci. [Utah Sta.],* 3 (1942), No. 4, pp. 3, 5, 6-7, 8, 10, figs. 6).—Sugar Beet Seed Becoming Important Farm Crop, by W. W. Owens (p. 3), mentions new production methods making sugar beet seed growing profitable in certain areas in Utah. Sugar Beet Research, by E. Carsner (pp. 5, 10) (U. S. D. A.), summarizes current activities in control of curly top by breeding resistant varieties, seed production, plant

cover studies, and physiological and plant food investigations, all with sugar beets. New Segmented Sugar-Beet Seed Promises To Reduce Labor Requirements of This Important Crop (p. 10) comments on a method to enable planting of single seed and minimize labor in thinning. Examples of agrohomie research with practical application to war emergency problems reviewed include range reseeding (E. S. R., 88, p. 187), pastures on alkali land, economy of pastures, a new wilt-resistant alfalfa variety, and advantages of Velvon barley, Uton oats, a new rust-resistant wheat variety, and corn hybrids found adapted to Utah.

Grass—the stockman's greatest asset, H. L. WALSTER (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 2, pp. 2-7).—Facts on grassland in North Dakota, derived extensively from research of the station, cover grassland types, composition of native and tame grasses and prairie hay at different growth stages, relation of climate to growth and adaptation, and harmful aspects of overgrazing.

The grasses of Mauritius and Rodriguez, C. E. HUBBARD and R. E. VAUGHAN (*London: Waterlow & Sons*, 1940, pp. 128, figs. 16).

A comparison of used and unused grassland mesas in the Badlands of South Dakota, F. LABSON and W. WHITMAN. (U. S. D. A. and N. Dak. Expt. Sta.). (*Ecology*, 23 (1942), No. 4, pp. 438-445, figs. 2).—Total protection maintained a mixed-grass type dominated by western wheatgrass and dry-land sedges, while combined mowing and light grazing during 40 yr. produced a short-grass type dominated by blue grama grass. The short-grass type produced the greatest density of vegetative cover, and the mixed-grass type greatest forage yield. Needle-and-thread, not a major dominant on the completely protected mesa, was most abundant on the intermittently used mesa. Mowing and grazing apparently had reduced greatly amounts of this species and of *Carex elcocharis* and *C. pennsylvanica* on the mowed mesa. Forbs and woody plants, negligible on the protected mesa, made up much of the cover on the other mesas. Accelerated soil erosion was not evident, but the mowed mesa lacked the thick plant mulch that was on the two other mesas.

Improving range conditions for wartime livestock production, F. G. RENNER and E. A. JOHNSON (*U. S. Dept. Agr., Farmers' Bul.* 1921 (1942), pp. [2]+18, figs. 14).—Range conditions are discussed and illustrated, with descriptions of characteristics of soils and forage by which the ranchers can determine which lands need improvement. Ways to improve range outlined include conservative stocking, use of range according to seasonal growth requirements of forage, better distribution of livestock, and grazing the kind and class of livestock for which the forage and range are best suited.

A short-cut method for estimating grazing use, R. H. CANFIELD (*U. S. Dept. Agr., Forest Serv., Southwest. Forest and Range Expt. Sta. Note* 99 (1942), pp. 5, fig. 1).—The method described for estimating grazing use uses a relationship which, for the mixed semidesert grass type on the Santa Rita (Ariz.) Experimental Range, was established as existing between amount of a grass stand grazed to a stubble height of 2 in. or less, amount grazed above a 2-in. stubble height, and the ungrazed complement.

The effect of boron on seed production of alfalfa, A. L. GRIZZARD and E. M. MATTHEWS. (Va. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 365-368).—On Cecil sandy loam at Chatham, Va., application of 15 lb. per acre of borax resulted in production of from 82 to 184 lb. of seed per acre, while alfalfa receiving no borax failed to set seed. Increases in hay yields ranging from 280 to 743 lb. per acre also were attributed to use of borax. See also an earlier note (E. S. R., 86, p. 616).

History of the development and industrial use of barley in North America, J. G. DICKSON. (Univ. Wis. and U. S. D. A.). (*Amer. Brewer*, 76 (1943), No. 1, pp. 70-71, 104, 106, 108, fig. 1).

Barley freaks, M. L. MARTINI and H. V. HARLAN. (U. S. D. A.). (*Jour. Hered.*, 33 (1942), No. 10, pp. 338-343, figs. 3).—Unusual barleys produced in extensive breeding work at the Aberdeen (Idaho) Substation included the types named Grandpa, Fine Stripe, Hoodawn, Multiflorus, Many-noded Dwarf, Mary Dwarf, and Lyallpur and leaf, culm, and rachis variations.

The loss of nodules from legume roots and its significance, J. K. WILSON, (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 460-471, figs. 3).—Wild white clover was grown under controlled conditions in the greenhouse to about 4 in. high and clipped periodically to about 0.5 in. high, a procedure probably simulating the maturing physiological conditions of many legumes and corresponding to defoliation received under conditions of good grazing management. Defoliation like shading, drying out of the soil, or maturity of the plant caused some nodules to be shed and subsequently to decay. At the initiation of new growth the starch in the nodules largely disappeared, and if this withdrawal was severe enough the nodules became waterlogged and usually disintegrated. These phenomena might account for the higher N content expressed as percentage of dry weight in old nodules and for much of the increase of N in the nonlegume growing in association with the legume.

Influence of distribution of rainfall and temperature on corn yields in western Iowa, E. E. HOUSEMAN and F. E. DAVIS. (U. S. D. A. coop. Iowa State Col.). (*Jour. Agr. Res. [U. S.]*, 65 (1942), No. 12, pp. 533-545, figs. 5).—The analysis covering effects of both rainfall and temperature on corn yield employed yield data, 1924-38, from six widely distributed townships in western Iowa having uniform soil and cultural conditions and containing or adjacent to several weather stations affording suitable weather data. Pooling of data for several locations in lieu of a longer series of observations desirable in Fisher's method of analysis employing rainfall for short intervals seems to have been used successfully. Effects of one additional inch of rain above normal fall for July and August was studied and a regression curve drawn. Regression seemed to be of slight aid in estimating corn yield. Practically none of the variation in corn yield was accounted for by variation in amount or distribution of rainfall. Rainfall in western Iowa usually is near optimum. Yield appeared to be related more closely to temperature than to rainfall.

Duration of receptiveness in corn silks, D. F. PETERSON. (Idaho Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 369-371, fig. 1).—Receptiveness of corn silks to pollen, as studied by seed setting, extended longer than 19 days. Seed setting by 1-day-old silks was to the extent of 58 percent and by 2- to 8-day-old silks was rather uniform, averaging 91 percent, with subsequent decline, reaching 8 percent on silks 19 days old.

An adequate sample of corn plots with reference to moisture and shelling percentages, G. F. HENRY, E. E. DOWN, and W. D. BATEN. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942) No. 9, pp. 777-781).—An experiment involving 10 varieties was made to determine the number of ears necessary for an adequate sample at harvesttime of a variety for moisture content of grain and for shelling percentage. By use of a formula numbers of ears were found for different replications and varieties. An adequate sample is one such that the standard deviation of its mean will at most equal 5 percent of the grand mean.

Prehistoric maize from Cañon del Muerto, E. ANDERSON and F. D. BLANCHARD (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 832-835, figs. 4).—The 222 ears of corn examined resembled in general appearance those now grown by the

Papago and other tribes rather than modern Pueblo corn. Most of the corn had floury endosperm, though a few ears were flinty. Pericarp was either red, colorless, or mosaic (P^{rr} , P^{mo} , or p .)

Hemp, a war crop for Iowa. C. P. WILSIE, E. S. DYAS, and A. G. NORMAN. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P49* (1942), pp. 585-600, figs. 8).—Information on the growing of hemp in Iowa (especially in 15 north-central counties), based extensively on experience with the crop in Wisconsin, deals with the current war needs; soil and fertility requirements; cultural methods and field practices; harvesting, retting, and handling the crop; processing the fiber; contracts for hemp acreage; and landlord-tenant relations in hemp production.

Seed production by kudzu (*Pueraria thunbergiana*) in the southeastern United States during 1941. P. TABOR. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, p. 389).—A note.

Chemical composition and grazing value of Napier grass, *Pennisetum purpureum* Schum., grown under a grazing management practice. R. E. BLASER, W. G. KIRK, and W. E. STOKES. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 167-174, figs. 3).—Napier grass selections of disease-resistant types were established in two areas on Leon, Plummer, and Alachua unproductive sandy soil types, fertilized differently, fenced into five paddocks, and grazed rotationally, 1938-40. The stocking permitted the consumption of most grass blades in from 5 to 8 days, thus allowing 20 or more days between grazings for the grass to recover. The grass as managed for grazing contained more dry matter and protein than grass managed for soilage. The ungrazed residue (primarily stems) was inferior to consumed grass in protein, ash, Ca, P, fat, and fiber but slightly higher in carbohydrates. Highly fertilized grass produced an average of 231 animal days grazing, 369 lb. of beef per acre, and 1.60 lb. of gain daily for the 3 yr. Grass fertilized lightly averaged 155 animal days grazing, 219 lb. of beef, and 1.41 lb. gain daily, 1939-40. Desirability of using plants with uniform genotypes for grazing tests with tall growing grasses was shown. As managed for grazing in these experiments, Napier grass was very palatable and nutritious during the entire season and produced much higher daily gains than other grasses tested in Florida. It appeared especially desirable for fattening paddocks and for supplementary grazing.

Potash deficiency symptoms in Napiergrass, *Pennisetum purpureum*, G. W. BURTON and C. L. LEFEBVRE. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 372-375, figs. 2).—Formation of irregular brown spots on Napier grass leaves and sometimes "firing" of leaf tips and margins was a reasonably dependable index of K starvation. Very leafy strains developed K-deficiency symptoms earlier and to a greater degree than less leafy types. The high K requirement of Napier grass could be supplied with rather large quantities (200 lb. per acre) of KCl. Severe K-deficiency symptoms have been developed by velvetbeans following Napier grass in rotation.

Observations on the flowering habits of four *Paspalum* species, G. W. BURTON. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 843-848, figs. 3).—The blooming behavior of Dallis grass (*P. dilatatum*), Vasey grass (*P. urvillei*), Bahia grass (*P. notatum*), and *P. malacophyllum* as related to certain climatological factors is presented.

[Potato and sweetpotato research] (*Kans. State Hort. Soc. Bien. Rpt.*, 46 (1940-41), pp. 99-126, 207-223, 229-255, figs. 5).—Papers of interest to specialists include Irish Potato Disease and Insect Control by Breeding Varieties Resistant to Their Attacks, by F. J. Stevenson (pp. 99-107), and Improving Profits on Sweet Potatoes Through Increased Yields and Higher Quality, by V. R. Boswell (pp.

117-126), (both U. S. D. A.); Report on Potato Experimental Work—Irrigation, Varieties, and Fertilizers (pp. 109-115), Progress Report on 1941 Irish Potato Investigations (pp. 207-213), and Distribution of Kansas Potatoes (pp. 235-243), all by S. W. Decker, The Prevention of Ring Rot Infection in Potato Seed Stocks (pp. 219-223), and Prevention of Sweet Potato Diseases (pp. 251-255), both by O. H. Elmer, and Storage Conditions for Kansas Potatoes, by H. R. Fox (pp. 229-234) (all Kans. Expt. Sta.); and The Bacterial Ring Rot Situation in the United States (pp. 215-218), and The Production of Early Irish Potatoes (pp. 245-249), both by C. H. Metzger.

Some cold storage studies of Kansas potatoes, F. L. PARSONS (*Kansas Sta. Bul.* 310 (1942), pp. 18, figs. 4).—In 1939-41, data were obtained on shrinkage and deterioration. Relationships between humidity, temperatures, and evaporation in relation to shrinkage and deterioration also were observed in separate cold-storage rooms.

Storage of potatoes of U. S. No. 1 quality was deemed preferable to storing the lower grades. Deterioration and shrinkage during cold storage were severe where decay and sun damage were among the tuber defects. Since about one-half the total shrinkage of good potatoes in cold storage over a 6-mo. period will occur during the first few weeks, sacks of potatoes should contain from 103 to 106 lb. (depending on the storage period) if the market of 100-lb. sacks of potatoes out of storage is desired. With ideal cold-storage conditions and U. S. No. 1 potatoes, use of closely woven cotton sacks will decrease the weight shrinkage compared with potatoes in burlap or open-mesh sacks. Where quality is uniformly good, shrinkage in weight of washed and clean unwashed potatoes is about the same, whereas washed potatoes of low grade shrink more and deteriorate faster than unwashed potatoes in cold storage. Triumphs shrank slightly less than Cobblers. Ultraviolet ray treatment had no effect on the keeping quality of potatoes with certain common defects.

For best results, potatoes evidently should be placed in cold-storage rooms where circulation of air is enough to prevent condensation of moisture on the tubers after the first week or two of storage. Less shrinkage and minimum deterioration will occur if the relative humidity remains fairly uniform at from 85 to 90 percent. The most satisfactory cold-storage temperatures for potatoes are near 45° F. Temperatures below 40° over a long period may cause changes in flavor.

Cold storage of potatoes may be desirable to avoid selling on a temporarily glutted market, to remove field heat or to condition the tubers to carry satisfactorily to market, and to store for a longer period and to market the potatoes locally through established outlets when potatoes are ordinarily shipped in. See also earlier notes (E. S. R., 86, p. 546; 87, p. 298).

Comparative yields of transplanted and direct sown rice, C. R. ADAIR, H. M. BEACHELL, N. E. JODON, L. L. DAVIS, and J. W. JONES. (U. S. D. A. and Ark., Calif., La., and Tex. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 34 (1942) No. 2, pp. 129-137).—Average yields of Caloro rice, 1937-39, from direct seeding, as practiced in the United States, were significantly higher in Louisiana and California than from transplanting, the Oriental method. Early Prolific also averaged higher from direct seeding than from transplanting in Louisiana, California, and Texas, and so did Arkansas Fortuna in Arkansas and Louisiana. None of the varieties at any of the four rice stations averaged significantly higher when transplanted than when sown direct.

Milkweeds and natural rubber, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 2, pp. 11-15, figs. 4).—A popular discussion of milkweeds (*Asclepias* spp.) and other plants secreting latex or containing rubber, including dogbanes,

Euphorbia spp., the chicory group, mulberry family, and such plants as guayule, Colorado rubber plant, and rabbitbrushes.

Edible soybean—a food crop for Hawaii, C. G. LENNOX (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 3, pp. 139-158, figs. 7).—Cultural requirements for soybeans for food and forage are outlined, with remarks on the status of the crop, its products, use as food (including recipes), nutritional value of green edible soybeans, varieties, and insect pests and diseases. Acre yields of green shelled beans, in preliminary tests, ranged from 3,650 to 4,450 lb. The crops' response to length of day may be important in choice of varieties. Current recommendations are to plant Hokkaido, Emperor, and Imperial in March and April, and these varieties and Hahto in July and August; Hahto, Sac, and Seaweed in May and June; and Seminole and Giant Speckled in September through February.

Comparison of the efficiency of single applications with repeated top dressings of nitrogenous fertilizers in increasing the yield of dry matter, nitrogen, and vitamin C (ascorbic acid) of Sudan grass, F. L. WYND. (Univ. Ill.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 645-651).—The relative efficiencies of ammonium sulfate and phosphate on Brennan fine sandy loam were studied when a given amount was added at seeding time and when part was applied at seeding and the rest as a later top dressing. The first cutting of grass was made at 25 days after planting and the second 11 days later. The greater efficiency per unit of added N for increasing total dry-matter yield was found when all the fertilizer was applied at seeding time, and the phosphate was significantly more efficient than the sulfate. The greater efficiency per unit of added N for increasing the recovery of N by the two cuttings was also obtained with the single application of fertilizer, and here again phosphate was the more efficient material.

As to vitamin C, its total yield became less with increases in dry-matter yield and N recovery by the crop. Here, the greater efficiency per unit of N added was found when part of the fertilizer was applied at seeding and part just after the first cutting, and with the sulfate over the phosphate. A tentative explanation is offered relative to the comparative efficiency of N fertilizers based on their distribution throughout the soil profile and on the depth of the plant root system.

Plant hormone treatment of sugar beet seed, S. B. NUCKOLS. (U. S. D. A.). (*Sugar*, 37 (1942), No. 9, pp. 22-23).—Treatments of sugar beet seed with Hormodin "A," thiamin hydrochloride (vitamin B₁), honey, and with Hormodin powders did not, at the rates used, result in any significant improvement in acre yields of roots, in sucrose percentages, or in acre yields of gross sugar.

The distribution of mineral elements in the sugar beet as influenced by different preceding crops, W. E. CARLSON. (Mont. Expt. Sta.). (*Soil Sci.*, 54 (1942), No. 6, pp. 425-437).—Nutrition of sugar beets as influenced by four preceding crops was followed progressively through the growing season at Huntley. Acre yields of clean beets were 17.5 tons on potato ground, 15 after beans, 9.5 after alfalfa, and 8.5 tons on beet ground. The amounts of all minerals usually increased from the first to last samplings. Early rapid adsorption of nutrients by sugar beets after beans and potatoes might account for their superiority as preceding crops. P appeared to be the limiting factor of growth after the four preceding crops. Its deficiency was greatest after beets and alfalfa and least after beans and potatoes. The cation balance in tops and roots was altered by growth of different preceding crops.

A study of optimum crop length, R. J. BORDEN and F. C. DENISON (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 3, pp. 119-137, figs.

15).—Monthly growth rates of H 109 sugarcane were influenced differentially by the month of starting the crops. Crops started nearer midyear made a uniform monthly elongation thereafter, whereas winter-started crops showed subsequent seasonal effects appearing as both high and low peaks on growth curves. Rates of growth for stalks of all ages were highest between July and October. Age effects, regardless of seasonal effects, were shown as an almost straight-line reduction in elongation between 8 and 25 mo. Numbers of millable stalks at harvest were not influenced by month of start or age at harvest; average length and weight of stalks were affected by the changing status of stalk population. Crusher juice analyses were influenced by age at harvest, e. g., the P percent increased with an increase in age, and both N and K decreased in concentrations as crops became older at harvest.

The crops started in midseason gave yields superior to those starting earlier or later, regardless of age at harvest. The rate at which cane was produced by plant crops fell off sharply after 22 mo., but ratoons continued to make cane at a uniform rate up to 25 mo. Although cane quality continued to improve with age up to 25 mo., sugar yields followed the trends in cane yields. The optimum age to harvest H 109 evidently was at 22 mo. for plant cane and at 25 mo. for ratoons, regardless of the time of starting the crop.

The first application of nitrogen, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 46 (1942), No. 3, pp. 103–104, figs. 2).—Development of an excellent crop of 32–8560 sugarcane in a 4-mo. period on a low-N Makiki soil during the best growing weather of the year from application of 40 lb. of N per acre suggested that a much larger initial amount is probably excessive and may be used inefficiently by the crop. See also earlier notes (E. S. R., 87, p. 218).

Sugar cane investigations in progress at the agricultural experiment station of the University of Puerto Rico, J. A. B. NOLLA (*Asoc. Téc. Azucareros Cuba, Proc. Ann. Mtg.*, 15 (1941), pp. 31–37).

The time and rate of nutrient absorption by flue-cured tobacco, A. L. GRIZZARD, H. R. DAVIES, and L. R. KANGAS. (Va. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 327–339, fig. 1).—In experiments with flue-cured tobacco (E. S. R., 85, p. 616) at Chatham, Va., in 1939 and 1940, differences in crop yield and value per acre due to different fertilizer treatments usually were of doubtful significance. Improvement in yield and value occurred when one-half of the K was withheld and used as a side dressing 21 days after setting out the plants. Absorption of plant food and development of tobacco proceeded slowly during early growth stages (0–35 days) after transplanting, in contrast to the very rapid rates during later periods (36–63 days); N absorption was relatively low during the last interval of growth (50–63 days), while absorption of the other nutrients was high. This emphasized the importance of having available during the latter part of the growing season plenty of nutrients, except N, which should be low during the last 2 weeks. Nutrients contained in the sap, absorption of nutrients per acre by the crop, and chemical composition of leaves and stalks are tabulated for transplants and for growth intervals of 0–21 days, 22–35, 36–49, and 50–63 days.

Quality characteristics of hard red winter wheat varieties grown in cooperative plot and nursery experiments in the hard red winter wheat region in 1940, M. A. BARMORE, K. F. FINNEY, and M. E. MCCLUGGAGE. (Coop. Kans. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus.*, 1942, pp. [1] + 31, figs. 11).—Quality characteristics of plot and nursery samples of wheat varieties grown in 1940 in cooperation with State experiment stations, as determined in milling,

chemical, and baking studies, are tabulated and discussed, together with averages for the 1938-40 crop nursery samples. Brief reports are also made on special research on the pearling test, micromilling and baking, bromate response and requirement, mixing time, protein content and loaf volume, loaf volume at abnormal protein levels, viscosity as a measure of hard wheat quality, and colloidal investigations.

Quality studies of wheat varieties grown in the Western region in 1941. C. C. FIFIELD, H. C. FELLOWS, T. F. HARTSING, R. WEAVER, J. F. HAYES, E. HOFFECKER, and B. E. ROTLIGER (*U. S. Dept. Agr., Bur. Plant Indus. and Agr. Market. Admin., 1942, pp. 17*).—Milling, baking, physical, and chemical characteristics were determined on about 90 samples of wheat varieties grown at experiment stations in 1941 and on 9 composite samples representing each of the principal grades of white wheat received on 3 commercial markets. The spring wheats with hard texture, e. g., Marquis, Merit, and White Federation, were generally lowest in acre yield and highest in protein content. The carotenoid content of grain was high for all club varieties except Elgin. Varieties of other classes usually high are Onas, Federation, and Rex. Excellent yellow loaf cakes were made from all varieties with a high particle size index, including Irwin Dicklow, Lemhi, Federation, Onas, Baart, Rex, Hymar, and Triplet. Varieties consistently making good cookies have all had medium to high pearling indices. The best bread, in general, was made from hard red spring and certain white varieties, including Marquis, Merit, White Federation, Baart, and Idaed. Among winter wheats, the hard red winter and the white wheats—Rex, Kharkof, and Turkey selection (C. I. 11530)—made the best bread.

North Dakota wheat quality in 1942: Some preliminary observations on several hard red spring wheat varieties, R. H. HARRIS (*North Dakota Sta. Bimo. Bul., 5 (1942), No. 2, pp. 26-27*).—Hard red spring wheats produced at the different substations in North Dakota in 1942 have been high in test weight and vitreous kernel content, kernels plump and well-filled, and the grades excellent because of high bushel weight and absence of visible damage. Wheats examined in 1942 are distinctly higher in test weight, flour yield, and wheat protein content than 1941 samples of the same varieties grown at Edgeley and Fargo. Varietal differences are mentioned.

Nut grass eradication studies.—III, The control of nut grass, *Cyperus rotundus* L., on several soil types by tillage, E. V. SMITH and E. L. MAYTON. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 34 (1942), No. 2, pp. 151-159*).—Cooperative tillage experiments on 10 soil types, 1938 and 1939, showed that nutgrass (*E. S. R., 79, p. 190*) can be nearly eradicated from soils ranging in texture from sandy loam to plastic clay by plowing at 3-week intervals during two successive growing seasons. If a clean-cultivated crop is planted the next year and the few remaining tubers removed as they sprout, eradication will be complete. Results comparable to those with a turn plow followed plowing with a scrape (sweep) or a tractor disk, while a light, horse-drawn disk was unsatisfactory. Unsatisfactory results on an area of low, poorly drained clay indicated that tillage methods should not be used for nutgrass control on areas likely to remain wet long.

Ecological aspects of the pricklypear problem in eastern Colorado and Wyoming. G. T. TURNER and D. F. COSTELLO. (U. S. D. A. coop. Colo. State Col.) (*Ecology, 23 (1942), No. 4, pp. 419-426, figs. 5*).—The distribution, characteristics, reproduction, and growth adaptations of pricklypear (*E. S. R., 86, p. 325*), and its reaction to drought, insects, rodents, soil drifting, and grazing are described from extensive studies in the region.

HORTICULTURE

[**Horticultural investigations by the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1942, pp. 10-11, 14-16, 17, 19-21).—Included are progress reports on investigations under the direction of D. M. Crooks, J. R. Magness, B. Y. Morrison, and E. W. Brandes dealing with the production of drug plants, the use of castor oil to replace tung oil, the production of substitute tanning plants, the growing of dry-land gardens, nitrogen requirements of apple trees, new spray materials for control of apple scab, development of new peach varieties, the relation of K deficiency to composition of oranges, the breeding of chestnuts resistant to blight, production of healthy tomato plants for northern shipment, the breeding of lettuce varieties, carbon dioxide treatment of cherries for shipment, importation of strategic plant materials, identification of plant materials, the use of sphagnum moss for growing seedlings, selection and propagation of high-yielding resistant strains of the hevea rubber tree, and the testing of various plants as potential sources of rubber.

[**Horticultural investigations in the Southern States**] (*Assoc. South. Agr. Workers Proc.*, 43 (1942), pp. 171-173, 174, 175-181).—Abstracts of the following papers are listed in these proceedings: Genetics of Cultivated Cucumber, by C. F. Poole (pp. 171-172) (U. S. D. A.); Breeding Cucumbers and Muskmelons for the South, by J. M. Jenkins, Jr. (p. 172), and The Effect of the Number of Plants Per Hill and Hill-Spacing on the Fruiting Behavior of the Cantaloupe, by O. B. Garrison (pp. 172-173) (both S. C. Expt. Sta.); Preliminary Results Obtained in the Use of Phosphorus as Compared With Other Fertilizers With Tung Trees, by S. R. Greer (p. 174) (Miss. Sta.); The Use of a Mist Spray in Rooting *Rubus* Single-Bud Stem Cuttings, by S. H. Yarnell and H. T. Blackhurst (p. 175) (Tex. Sta.); Root and Shoot Production by Young Pecan Trees Treated With Indole-Butyric Acid at the Time of Transplanting, by A. C. Gossard (p. 175) (U. S. D. A.); Peach Cultural Tests, Including Sods and Clean Culture, by A. J. Olney and W. D. Armstrong (p. 176) (Ky. Sta.); Breeding Strawberries for the South, by J. C. Miller (p. 177) (La. Sta.); Nutrition of Strawberries in the Upper South, by M. M. Parker (pp. 177-178) (Va. Truck Sta.); Breeding Raspberries for the South, by B. D. Drain (p. 178) (Tenn. Sta.); Results of Breeding Work With the Muscadine Grape, by E. F. Savage (p. 179) (Ga. Sta.); Vitamin C Content of Snap Beans and Cabbage, by B. L. Wade and C. F. Poole (pp. 180-181) (U. S. D. A.); and The Vitamin Content of Peaches, by L. O. Van Blaricom (p. 181) (S. C. Sta.).

[**Horticultural studies by the Georgia Station**]. (Partly coop. U. S. D. A.). (*Georgia Sta. Rpt.* 1942, pp. 41, 74, 77, 93-94, 94-98, 99).—Reports are presented on the breeding of a new sweet corn—Cherokee; breeding watermelons for wilt resistance; breeding tomatoes for resistance to nematodes, *Fusarium* wilt, and *Scotoria* leaf spot; storage of fruits and vegetables; collard breeding; transplanting solutions for pimiento pepper plants; variety tests with snap beans and garden peas; dahlia variety trials; peach fertilizer tests; cover crops for peach orchards; growth and distribution of peach roots; effect of pruning on peach root development; testing of peach varieties; the use of preharvest chemicals on the peach; sawdust mulch for strawberries; tests of strawberry and raspberry varieties; effect of fertilizer on strawberry yields; and culture of the blueberry.

Studies reported from the Mountain Substation include lettuce and garden pea trials, tests of herbs, and the use of overhead irrigation on vegetables.

[**Horticultural investigations by the Kansas Station**] (*Kansas Sta. Bion. Rpt.* 1941-42, pp. 19-20, 31-34).—Included are comments on the progress of

studies by E. Abmeyer, R. I. Throckmorton, W. F. Pickett, G. A. Dean, R. J. Barnett, G. A. Flinger, S. W. Decker, C. J. Birkeland, and L. R. Quinlan on the cultural needs of apple trees, the use of lime-sulfur for control of apple scab, the use of preharvest sprays to delay drop of apples, the mulching of strawberries, the effect of wax emulsions on newly transplanted conifers, the selection of cold-resistant French crab seedlings, relation of orchard site and mulch treatment to winter injury, testing new varieties of tree fruits, electrolytic resistance as a measure of hardness in brambles, variety tests of vegetables, gas injury of greenhouse plants, relation of leaf structure to rate of photosynthesis in fruit trees, variety tests of herbaceous perennials, and the effects of the November 1940 freeze on trees and shrubs.

[**Horticultural studies by the Montana Station**]. (Partly coop. U. S. D. A.). (*Montana Sta. [Bien.] Rpt. 1941-42*, pp. 32-33, 43-44, 54).—Included are brief progress reports on the culture of the tomato, onion, cucumber, and squash, the use of commercial fertilizers for vegetables and fruits, and tomato and sweet corn varieties for Montana, all by F. M. Harrington; boric acid for apples and cherries, the value of leguminous cover crops for sweet cherry trees, and the desirability of limiting the period of clean cultivation in the cherry orchard, all by W. E. Pollinger; and the testing of trees and shrubs for shelterbelt uses, and methods of transplanting shelterbelt seedlings to increase survival, both by R. M. Williams.

[**Horticultural studies by the Oregon Station**]. (Partly coop. U. S. D. A.). (*Oregon Sta. Bul. 401 (1941)*, pp. 35-36, 39, 42-43, 54, 55, 62, 66-67, figs. 3).—Information is presented on studies of the effect of ethylene on the ripening of fruit, pollination of the pear, naphthaleneacetic acid to prevent fruit drop, the relation of pruning to pear production under differential soil moisture treatments, variety tests with blackberries, culture of the hop (including a labor schedule), variety trials with vegetables, the effect of boron on certain vegetables, the storage of rose plants, and the balling of nursery stocks.

[**Horticultural studies by the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 429 (1942)*, pp. 17-19, 23, 35-37, figs. 2).—Included are reports on various studies, by C. O. Dunbar, W. S. Clarke, Jr., R. D. Anthony, F. G. Merkle, E. C. Dunkle, W. R. Whitacre, F. N. Fagan, W. S. Beach, E. M. Rahn, C. E. Myers, J. W. Sindon, G. J. Stout, and C. A. Thomas, on the use of Ladino clover and other plant materials as orchard cover crops, the relation between orchard cover sites and low-temperature injuries, sources of N for the orchard, the need of phosphorus and potash to maintain cover crop growth, the harmful effects of continuous cultivation in the apple orchard, the need of wise use of fertilizer in the orchard during the emergency, the harmful effect of bruising on the condition of apples, the beneficial effect of drying soil on the control of damping-off injury to seedlings, the testing of vegetable varieties including the Penn State Ballhead cabbage and Pennheart tomato, the composting of manure for mushroom culture, the possibility of overirrigating vegetables growing on heavy soil, the value of starter solutions in tomato production, and the fumigation of greenhouse beds to control symphyllids.

[**Horticultural studies by the Puerto Rico Station**] (*Puerto Rico Sta. Rpt. 1941*, pp. 3-5, 7, 10, 11-14, 15-17, 18).—Information is given on the progress of studies on the culture, pollination, and breeding of vanilla plants, by A. G. Kevorkian and E. Hernández Medina; varieties of coffee (coop. P. R. Univ. Sta.), by J. Guiscafré Arrillaga and L. A. Gómez; the culture of *Cinchona*, by Kevorkian; the growing of ginger and other miscellaneous spice crops, including nutmeg, Ceylon and Malaya cinnamon, tonka-beans, and black pepper, by C. Aleamar, Jr., and W. Pennock; the propagation (by A. Lee and A. Arroyo)

and utilization (by J. K. Alvis) of bamboo for fishing rods; the culture of head lettuce and the production of cantaloup and lima bean seeds, both by W. K. Bailey; the culture and physiology of rotenone-producing crops such as *Derris elliptica* and *Lonchocarpus nicou*, by R. H. Moore and M. A. Jones; and the testing and propagation of newly introduced plants and the occurrence of polyembryony in the mango, both by C. L. Horn.

Early gardens best started during winter, L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 5 (1942), No. 12, pp. 1, 8).—Late fall or early winter was found to be a favorable season for plowing and preparing the soil for early vegetable gardens. Some of the more hardy species may be planted in January and February in Mississippi. The details of operations are discussed.

Asparagus production, H. C. THOMPSON (*New York: Orange Judd Pub. Co.*, 1942, pp. 124, figs. 12).—This book was prepared by a member of the staff of the [New York] Cornell Experiment Station and presents up-to-date information on the principles and practices of asparagus production.

A study of the time of development of the fibrous sheath in the sidewall of edible snap bean pods with respect to quality, F. C. STARK, JR., and C. H. MAHONEY. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 353-359, figs. 2).—Histological studies of Giant Stringless Green Pod and Bountiful bean pods indicated that the tissue, which has been termed the fiber of the side wall and parchment, is actually the mesocarp. The tissue begins as a one-celled layer of parenchyma and later develops into a region of several cells in thickness. An increase in width of the inner mesocarp occurs in a constant proportion for both varieties until the pods attain the No. 5 sieve size. Cool temperatures and high rainfall had a depressing effect on increased cell wall thickness. The thickening of the cell walls of the inner mesocarp in pods grown in 1940 was entirely hemicellulose, with no lignin found.

The effect of storage on the betanin and sucrose content of garden beets (*Beta vulgaris*) and its importance in a breeding program with this crop, L. C. CURTIS. (Conn. [New Haven] Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 370-374, figs. 2).—Analyses of beet roots grown from seed sown July 26 and harvested September 30 and then placed in storage at 35°, 40°, and 50° F. showed an increase in sucrose and a decrease in betanin during the first 2 weeks. Roots from seed sown April 29 and dug on July 15 showed no such initial increase in sucrose but rather a gradual decrease up to 21 weeks when there was an appreciable decline. There was a significant increase in betanin at the end of 2 and 6 weeks, followed by a drop at the twelfth week. It is suggested that plant breeders might easily be deceived as to the potential value of their beet stocks unless analyses are made at a definite stage, preferably immediately after harvest.

The effect of manures, nitrogen compounds, and growth-promoting substances on the production of branched roots of carrots, G. J. RALEIGH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 347-352, figs. 2).—Cow or horse urine applied with complete nutrient solutions to carrots growing in sand so as to supply 1 percent or more of urine caused marked branching of the roots. Manures that contained no urine had relatively little effect. Urea, ammonium hydroxide, and ammonium carbonate all caused branching that could not be distinguished from that caused by urine. A number of growth-promoting substances used in varying dilutions did not produce typical branching. In the field, chicken manure, cow manure containing urine, and horse manure containing urine caused some branching of the roots, but the results were variable and not conclusive. In greenhouse experiments a mixture of cow manure and cow urine caused branching of soil-grown carrots.

Effect of temperature and photoperiod on seedstalk development in carrots, EL SAYED SAKR and H. C. THOMPSON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 343-346).—French Forcing carrots sown June 27 and dug October 1 were potted and placed in different temperatures and light durations. All plants that were subjected to 40°-50° F. for 15, 30, 45, or 60 days developed seedstalks or flower buds when grown later at 60°-70° under normal day length. Check plants which did not receive any low-temperature treatment did not develop flower primordia when grown at 70°-80°. The normal length of day was slightly more favorable for flower bud formation than was continuous light. It is conceded that length of day is not a very important factor in the initiation of flowering in the carrot. Where carrots were placed in storage at 35°, 40°, and 50°, subsequently potted, and placed in the greenhouse at 50°-60°, 60°-70°, and 70°-80°, the best results as to flowering were obtained in the lots grown at 50°-60°. Preliminary storage at 40° was more favorable than either 35° or 50°, and 50° was better than 35°.

Some effects of calcium and nitrogen upon peas, R. A. SCHROEDER. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 375-377).—Peas of the Little Marvel variety, grown in 1-gal. jars filled with subsoil of the Putman silt loam series modified with quartz sand to improve the texture, were supplied with different amounts of calcium and nitrogen along with an otherwise adequate nutrient solution. Nodulation was increased as the exchangeable calcium was increased up to 12 milliequivalents at both levels of nitrogen used. However, at each calcium level there was a significant increase in the number of nodules produced at the higher nitrogen level. Dry weights of the peas were increased significantly by inoculation in all except one treatment.

The effect of inoculation on maturity of canning peas in New York State, A. W. HOFER and J. K. WILSON. (N. Y. State Expt. Sta. and Col. Agr.). (*Soil Sci. Soc. Amer. Proc.*, 6 (1941), pp. 183-186).—Under New York conditions inoculated strips of peas may mature earlier, later, or at the same time as uninoculated strips. There is no marked tendency toward delayed maturity of inoculated peas in New York as has been reported elsewhere, and no factors have been found which will correlate with the earliness or lateness of the inoculated plats as compared with the controls. The only possibility is that on fields where inoculation produces a distinct yield response there may be a greater tendency toward delayed maturity of inoculated peas. The failure of inoculation to delay maturity in New York may possibly be explained, in part, by the fact that the pea nodule organism seems to be well distributed in the soils of the State, so that the effects of inoculation might well be less striking than in soils where the pea nodule bacteria do not occur naturally in such large numbers.

[Studies with canning peas in Alaska] (*Alaska Stas. Prog. Rpt.*, 1938-41, pp. 26-29).—Included are the results of studies of fertilizer requirements and on the rates of seeding.

A chemical test for pungency in peppers, S. V. TING and K. C. BARRONS. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 504-508, fig. 1; *abs. in Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, p. 179).—Taste tests for pungency in peppers were found unsatisfactory. A chemical test was devised in which a sample of the dried and ground fruit was treated with ether to extract the pungent principle, capsaicin, and the extract in turn was treated with a 1-percent solution of vanadium oxytrichloride in carbon tetrachloride until no further color change occurred. Sweet pepper extracts showed no green color reaction, while pungent peppers varied from a greenish yellow to a dark green as the content of capsaicin increased.

Propagation of sage by cuttings, W. L. DOBAN and A. M. DAVIS. (Mass. Expt. Sta.). (*Amer. Nurseryman*, 76 (1942), No. 5, p. 12).—Cuttings taken in winter rooted well without treatment if inserted in sand-peat or even in sandy soil. Rooting was hastened and somewhat improved if the bases of the cuttings were immersed for 24 hr. in dilutions of naphthaleneacetic or indolebutyric acid before placement in the sand-peat mixture. No bottom heat was provided, but the night temperature of the air was held at about 70° F.

Further studies on the effect of topping young tomato plants on fruit set and yield, K. C. WESTOVER. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 285-288, fig. 1).—This continuation of an earlier study (E. S. R., 87, p. 223) showed that pinching the main stem above the second leaf node about 2 weeks before the plants were set in the field reduced the early yields of the Early Baltimore and Marvelous varieties. As the season advanced, the yield differences decreased and lacked significance. Plants widely spaced in the flats or by potting were more productive than closely spaced ones.

Deciduous orchards, W. H. CHANDLER (*Philadelphia: Lea & Febiger*, 1942, pp. 438, figs. 109).—Prepared by a member of the staff of the California Experiment Station, this text discusses fruit production from the basis of research findings of workers in various fields.

A preliminary study of the manganese content of the leaves of some deciduous fruit trees, E. EPSTEIN and O. LILLELAND. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 11-18, fig. 1).—A chlorosis of peach leaves, identified as a manganese deficiency, was found to be associated usually with a manganese content in the leaves of less than 17 p. p. m. The range in Elberta peach leaves in June and July was from 6 to 293 p. p. m., suggesting a high luxury consumption of manganese in certain orchards. Changes in Mn content were not large throughout the summer, indicating that samples taken from June to October may be used to reflect the general Mn level. There was found in July 494, 246, 96, 81, 73, 66, 63, and 63 p. p. m. of Mn, respectively, in Elberta, walnut, almond, apple, prune, peach, pear, and cherry leaves collected on a single soil. Analyses of chlorotic leaves of six species from various soils gave values from 5 to 25 p. p. m., indicating no differences which could be correlated with the species.

The phosphate nutrition of fruit trees, III, IV. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 1-7, fig. 1; 41 (1942), pp. 1-10).—This series is continued (E. S. R., 84, p. 475).

III. *Comparison of fruit tree and field crop responses on a phosphate deficient soil*, O. Lilleland, J. G. Brown, and J. P. Conrad.—Evidence is presented to show that fruit trees established in Aiken clay loam at Paradise, Calif., did not respond to phosphate applications, whereas 18 annual crops failed to make satisfactory growth on the same soil unless phosphate was supplied. As determined by chemical and biological tests, the soil was extremely low in available phosphorus. The results demonstrated that the phosphate responses of annual plants cannot serve as criteria of the phosphate needs of fruit trees.

IV. *The phosphate content of peach leaves from 130 orchards in California and some factors which may influence it*, O. Lilleland and J. G. Brown.—Data are presented on the results of phosphorus determinations upon leaves collected from 130 orchards, including trees on the above-mentioned Aiken clay loam. The percentage of phosphorus in the dry matter of the leaves decreased rapidly during spring and early summer, followed by a period of minimum seasonal change until the leaves turned yellow in autumn. Variations were recorded between adjacent trees, and a greater variability was associated with trees having the higher analyses. Trees making good growth on a soil that was low in available phosphorus

had a phosphorus leaf content approximating that in many of the better orchards on the more fertile soils. Poor growth could be associated frequently with high phosphorus, and conversely many of the best orchards had a low phosphorus content.

The relative yields of border fruit trees, E. L. PROEBSTING. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 34-36).—Border trees in peach, pear, and apricot orchards do not necessarily outyield interior trees, particularly in orchards planted with adequate distance between trees and receiving good cultural care.

Statistical analyses of the fertilizer data from the Von Osten apple orchard, E. L. OVERHOLSER, F. L. OVERLEY, J. C. WILCOX, and D. F. ALIMENDINGER. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 19-22).—In this Wenatchee orchard tree growth, as measured by increases in trunk girth and in terminal growth, was not affected by applications of phosphorus. Nitrogen had a significant positive effect on tree growth, while potassium actually decreased growth. Nitrogen was the only element to increase yields significantly, largely by increasing the number of fruits. Applications of nitrogen alone or with phosphorus or potassium or with both decreased the red color of the fruits, but the loss was more than compensated for by increased production.

The use of metaphosphate in nutrient solutions, L. J. EDGERTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 237-239, fig. 1).—The possibility of using sodium metaphosphate in nutrient solutions buffered at high pH to maintain iron and other constituents in solution was shown in a study in which apple seedlings were grown for 10 weeks in solutions maintained between 7.3 and 7.5 pH. The seedlings supplied with the metaphosphate had normal green foliage as compared with marked chlorosis in plants in the nonmetaphosphate group. That apple plants are apparently able to utilize phosphorus in the meta form was shown in a phosphorus content in the stem and leaf tissues equally as high in the metaphosphate- as in the orthophosphate-supplied plants.

Rome trees respond to tillage in central Jersey, E. G. CHRIST. (*N. J. State Hort. Soc. News*, 24 (1943), No. 1, pp. 1449, 1457, figs. 2).—The plowing in May 1941 of alternate middles in a sod-bound Rome Beauty apple orchard resulted in vigorous growth and greatly increased production the following year on the sides of the trees adjacent to the plowed strips. Fruit color was not as good on the tilled side of the trees, but the greatly increased production more than offset this handicap.

Influence of submersion of the roots on transpiration, apparent photosynthesis, and respiration of young apple trees, N. F. CHILDERS and D. G. WHITE. (Ohio Expt. Sta. and State Univ.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 603-618, figs. 9).—The effects on young Stayman Winesap trees, growing on soil in 5-gal. containers, of submerging the roots in water for different periods were studied with the Heinicke-Hoffman apparatus. Experiments were conducted in the field and in an environment-controlled chamber. Transpiration and apparent photosynthesis were reduced within 2-29 days, usually within 2-7 days, following submergence. In some cases the rates of transpiration and apparent photosynthesis became so small with continued submersion that they could not be measured. Apparent respiration was increased within 2 days after submersion, but when the water was drained the rate of respiration returned to near the pretreatment level. Leaf temperature and stomatal behavior could not be correlated with low leaf activity due to root submergence. Leaves from submerged trees contained less water and less ash per unit of leaf surface than did those from check trees. The development of new roots and the formation of root hairs were inhibited by submergence.

The influence of some spray materials on the internal structure and chlorophyll content of apple leaves, W. F. PICKETT and C. J. BIRKELAND. (*Kansas Sta. Tech. Bul.* 53 (1942), pp. 54, figs. 18).—An explanation was sought of the factors involved in the reduction in the rate of photosynthesis as caused by certain spray materials commonly applied to apple leaves. The ratios of internally exposed surface in the palisade mesophyll to the internally exposed surface of the spongy mesophyll in the leaves of greenhouse-grown Jonathan, Wealthy, and York Imperial apple trees were in descending order. The palisade mesophyll and the spongy mesophyll comprised 85 and 15 percent, respectively, of the total internally exposed surface. There was a progressive decrease in the percentage amount of palisade mesophyll from the first to the third layer. In orchard trees, the difference between leaves from unsprayed and sprayed trees of a given variety was approximately the same at midseason as at the end of the season. The average number of upper palisade cells per unit area was greater in York Imperial than in Wealthy leaves and greater in sprayed than in unsprayed leaves. The average diameter of the first layer of palisade cells was reduced by sprays and was greater in field than in greenhouse trees. Spray materials checked cell development with each application consistently throughout the season in both greenhouse- and orchard-grown leaves. The so-called mild sprays had less dwarfing effect on palisade tissue than did the stronger materials. The chlorophyll content of greenhouse-grown York Imperial and Wealthy apple leaves was reduced by spraying but not so in the orchard. Under like conditions, the chlorophyll content was much greater in Wealthy than in York leaves, with Jonathan intermediate.

Commercial hand pollination methods for apples in the Northwest, J. C. SNYDER. (Wash. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 183-186, fig. 1).—The methods employed in collecting and applying pollen for the stimulation of fruit production in unfruitful or partially unfruitful varieties are discussed.

Development of the storage disorder brown core in McIntosh apples, W. W. SMITH. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 99-103, fig. 1).—A study of records maintained by a commercial storage firm indicated that brown core is more abundant in some years than others and that apples from certain orchards are more susceptible than from others. Observations on apples from 19 orchards failed to show any apparent correlation with fertilizer treatment, but there was some evidence that immaturity at harvest may have predisposed the apples to the injury. Other studies suggested that in years of little brown core maturity at harvest is a factor, but that in severe seasons it plays an insignificant part. An examination of fruits harvested from the north and south sides of McIntosh trees in a year of severe brown core revealed more brown core in fruits from the north side. Checking brown core development with weather conditions, it was indicated that high moisture and low temperature during the ripening period may be conducive to brown core development in the McIntosh apple.

A study of internal breakdown of Northern Spy apples in storage, I. BERNSTEIN and R. E. MARSHALL (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 156-162, figs. 3).—Very large Northern Spy apples did not keep well in storage because of susceptibility to internal break-down. Observations on apples from different cultural plots, including irrigation, indicated that differences in break-down susceptibility are associated primarily with size rather than any cultural treatment. In general, apples having the most red color were most susceptible. No significant difference was noted between apples stored immediately after harvest and those held for 1 week at 60° F. Evidence was obtained that increasing

the carbon dioxide content of the storage atmosphere was helpful in decreasing break-down. Spot harvesting of the apples over 3 in. in diameter some 10 days before regular harvest and their use before the middle of December is suggested. When the entire crop is picked at one time, the larger apples should be graded out for earlier disposal.

Softening and soluble solids in Bartlett pears as influenced by soil moisture, F. W. ALLEN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 106-112).—Examination of pears from orchards or trees receiving different amounts of water showed that fruit from nonirrigated trees was firmer and higher in soluble solids than that from irrigated trees. Soluble solids and total sugars were higher in the juice of "dry" fruit, but the ratio between the two was similar in dry and "wet" fruit. This was also true in comparing ratios of total sugars with total solids in dried pears. Winter rainfall apparently had little effect, as summer irrigation was necessary to maintain an available supply of soil moisture throughout the growing season.

Sweet cherry rootstocks (Farm and Home Sci. [Utah Sta.], 3 (1942), No. 4, p. 8).—Sweet cherry trees on mahaleb roots were found superior to those on mazzard or Stockton Morello. The mahaleb-rooted trees were more resistant to wind damage, excessive heat and drought, and to severe winter temperatures.

The effect of pruning upon the root distribution of peach trees, E. F. SAVAGE and F. F. COWART. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 67-70).—Records on two groups of Mikado peach trees growing in Cecil sandy clay loam, one lot receiving the conventional heavy pruning and the other comparatively light pruning, showed marked differences in growth and fruiting in favor of the light pruning. Lightly pruned 4-yr. trees were even larger than 5-year-old heavily pruned trees. There was no evidence that the degree of pruning had any effect on the nature of the root system except on total growth. Over 90 percent of the total tree roots and about 75 percent of roots less than 2 mm. in diameter were located within 18 in. of the soil surface.

Vegetative responses of the Elberta peach on Lovell and Shalil rootstocks to high chloride and sulfate solutions, H. E. HAYWARD and E. M. LONG, (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 149-155, fig. 1).—In the case of Elberta peaches on Lovell and Shalil roots grown in sand under differential salt treatments, total concentration of salt was found to be a major factor in the resultant growth depression. There was also evidence that certain specific ionic effects must be considered, e. g., a high concentration of the chloride ion caused certain marked leaf symptoms that did not occur with high sulfate concentration. The chloride ion was more toxic than the sulfate ion at isomotic concentrations. At the control and low-chloride levels trees on Shalil rootstock grew better than those on Lovell when compared with respect to secondary thickening, linear growth, weight, and volume. No significant differences between the two stocks were evident under the sulfate treatments.

Some results of acidity and catechol tannin studies of peach fruits, M. A. BLAKE and O. W. DAVIDSON. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 201-204).—Information is presented on the relative acidity and tannin content of a considerable number of peach varieties. In the very acid group were Duke of York, Fair Beauty, Fertile Hale, J. H. Hale, Mamie Ross, and Greensboro, and in the low acid group Chairs Choice, Mayflower, Goldeneast, Vedette, Admirable Jaune, and Eclipse. In the very high tannin group were Illinois, Mitchelson, General Lee, Golden Giant Cling, and Chinese Blood. Fruits high in both acidity and tannin were especially unpalatable. The crossing of two varieties with very acid fruits resulted in seedlings a high proportion of which bore acid peaches. The crossing of two varieties low in

tannin resulted in a progeny a considerable proportion of which was low in tannin, and reciprocally the crossing of two high tannin peaches yielded a large proportion of high tannin seedlings.

Additional studies of the acidity and tannin content of mature peach fruits. M. A. BLAKE. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 153-156).—A continuation of the above study gave further evidence that peach varieties differ markedly in acidity and in catechol tannin content. Although the 1940 and 1941 seasons varied greatly in climatic conditions, such as light, temperature, and moisture, certain varieties developed about the same acidity each year. It was noted that trees which for some reason became exceptionally high in carbohydrates tend to develop fruit exceptionally high in tannin for the variety. However, where such variations in growth status were carefully avoided, it was observed that fruits of certain varieties fluctuate rather widely in tannin from season to season while others are relatively uniform.

Tennessee Beauty strawberry. L. A. FISTER and B. D. DRAIN (*Tennessee Sta. Cir.* 81 (1942), pp. [4], figs. 2).—This new variety, obtained from a cross of Missionary × Premier, is described as to plant and fruit characters and uses.

Pollen-containing sprays for the cross-pollination of Ohanez grapes. T. C. DUNNE (*Jour. Dept. Agr. West. Austral.*, 2. ser., 19 (1942), No. 3, pp. 210-213).—Pollination of the Ohanez grape was successfully accomplished by spraying the flowers with a water suspension of pollen of a compatible variety. Spraying not only required less labor than hand pollination but was also more economical of pollen. Thorough wetting of the flower clusters was better than a mist application. A measure of control of the degree of fruit setting should be possible by adjusting the concentration of pollen in the water.

Preliminary studies on modified air storage of the Fuerte avocado fruit. J. B. BIALE. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 113-118, figs. 4).—Observations on Fuerte avocados stored for different periods in modified atmospheres, one consisting of 10 percent oxygen, 10 percent carbon dioxide, and 80 percent nitrogen, and the other with about one-third to one-half as much oxygen and carbon dioxide, indicated that both modified atmospheres favored the keeping of the avocado. The rate of carbon dioxide evolution was lower in the controlled atmospheres than in air, and apparently no climacteric rise in respiration occurred. Even the second set of conditions gave good results with respect to fruit softening, and the fresh appearance of the skin was maintained better than in air.

Seed production and seedling yields of some citrus varieties of possible value for rootstock purposes. E. MORTENSEN and C. R. RIECKER. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 145-148).—Evidence is placed on the importance of stock varieties which produce abundant seed capable of developing into rapid-growing, vigorous seedlings. Records taken on seed production of a number of citrus stocks showed the trifoliolate orange to lead, with an average of 45.9 seeds per fruit over a 3-yr. period. When seeds were sown, the citrange group made the best growth during the summer. The Carrizo citrange, trifoliolata, and sour orange rated highest in yield of usable stocks for budding. The Carrizo citrange is considered a promising rootstock for southern Texas.

Physiological studies of yield, quality, and maturity of Marsh grapefruit in Arizona. W. E. MARTIN (*Arizona Sta. Tech. Bul.* 57 (1942), pp. [2]-48, figs. 8).—Under Arizona environments citrus fruits often develop a relatively thick rind and coarse external appearance which lowers their market value. The most satisfactory and uniform production over a period of 4 yr. was ob-

tained by winter nitrogen treatments designed to bring about a relatively high nitrogen content in the tree at bloom. Treatments which maintained a high nitrogen content in the summer months following winter starvation resulted in somewhat irregular production tending toward alternate bearing. The use of nonleguminous cover crops, such as Sudan grass, in the spring and summer along with the elimination of nitrogen applications during the same period brought about a mild nitrogen starvation of the tree leading to a higher proportion of fruits of better commercial grades. Fruit from trees of low nitrogen content in autumn developed yellow color much earlier and the juice was sweeter. The size of crop and the age of tree were also factors affecting quality. Treatments restricting irrigation water tended to reduce quality. The winter nitrogen application appeared to have very little effect on quality of the fruit remaining on the tree over winter. If the fruit was of superior quality in autumn, it was usually relatively good in the spring.

Adjustment of yields in an experiment with orange trees, E. R. PARKER. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 23-33).—An analysis of data recorded in a fertilizer experiment with Washington Navel oranges, with a background of prior yields obtained during a 6-yr. uniformity test, indicated that the use of covariance on the yields of the uniformity trial resulted in a reduction in the experimental error. The reduction caused by such an adjustment was greater than that resulting from an elimination, by analysis of variance, of the effects of "yield groups" based on the same prior yields. The author concludes that rather permanent variations which are correlated with the yields during the uniformity trial, and also variations of a more temporary nature which affect areas of the orchard and are reflected by yields of check plats, are responsible for an important part of the variability in the experimental yields. In this experiment, the interpretation of yield effects as influenced by fertilizer treatments, by means of covariance, could be most accurately made by using the concurrent yields of the check plats and the yields of the final uniformity-trial year as independent variables.

Extending guava production in California, H. J. WEBBER. (Calif. Citrus Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 228-233).—Information is presented on the climatic and soil requirements of the guava, acreage available for its growth, varieties, vitamin content of fresh and dried fruits, and on commercial preparations.

The relationship between chlorosis of macadamia seedlings and certain chemical constituents of macadamia seeds, P. GUEST. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 61-64).—Observations on 22 lots of seedlings, each from seed of a single-bearing tree and all grown in washed coral sand, showed marked variation in the development of chlorosis. When the chlorotic condition was compared with the amounts of iron and manganese in the kernels, it was found that seeds with a relatively small amount of iron developed into seedlings with the more pronounced chlorosis. Much the same indication was seen for manganese, but when the data were subjected to analysis only iron was associated significantly with the expression of chlorosis.

Additional studies on delayed foliation of pecan trees, C. W. VAN HORN. (U. S. D. A. and Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 65-66).—In this second paper (*E. S. R.*, 87, p. 675), DNO spray applied in the dormant season to Burkett pecan trees growing near Yuma, Ariz., is shown to have increased yields significantly over nonsprayed controls. The spray advanced slightly the time of bud break in the Halbert variety, but had no effect on subsequent yields. The two varieties differed apparently in their chilling requirements for breaking dormancy.

A method of evaluating the nuts of black walnut varieties, L. V. KLINE (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 136-144, fig. 1).—A new method of judging the nuts of black walnut varieties, based on their income-producing potentialities, is proposed. Since nut development in a given tree varies from year to year, there is a need for conducting tests over a number of years. If the nuts are reasonably well cured, there appears to be no need for moisture determinations except in the case of detailed evaluations of more promising varieties, and here the moisture data should be adjusted to a common base moisture content. The author suggests that 25 nuts, taken at random from a representative lot, constitute an adequate sample except where very precise comparisons are required.

The influence of delayed hulling on the color and quality of eastern black walnut kernels, S. B. CHASE (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 131-135, figs. 2).—Both color and flavor of kernels were affected adversely by a delay in hulling, and within certain limits the changes in color and flavor were related directly to the length of time the nuts remained unhulled after maturity. Under the conditions employed it was possible to obtain light-colored, mild-flavored kernels by hulling within 7 days following harvest.

The production of guayule rubber under irrigation, G. E. P. SMITH. (Univ. Ariz.). (*Agr. Engin.*, 23 (1942), No. 10, pp. 312, 324, figs. 2).—The author outlines the history of the development of guayule rubber production from the inception of the cultivation of the shrub in 1911 to the present Government-directed projects. Failure of the production of guayule rubber is shown to have been solely the result of a very sharp drop in the price of Sumatra and Ceylon rubber when the first guayule plantings were in their third year.

Suggestions for the beginner with lilies, G. L. STATE (*Amer. Lily Yearbook*, 1942, pp. 70-79, figs. 7).—Information is presented on the importance of using disease-free stocks, varieties adapted to the beginner, time of planting, fertility requirements, etc.

Influence of bulb treatments on growth and flowering of the Easter lily, R. NELSON (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 105-120, figs. 6).—Mercury compounds, including organic and inorganic and soluble and of low solubility, proved toxic at all concentrations used. Red copper oxide, potassium permanganate, and chloride of lime either caused injury to the bulbs or dwarfed the plants and retarded flowering. Formaldehyde dust mixed with potting soil did not give beneficial results comparable with soaking bulbs for 30 min. in a 1:120 or 1:240 solution of formaldehyde. Formaldehyde solutions were slightly, or not at all, toxic, and sometimes stimulated earlier flowering. Dipping bulbs for 1 min. in a suspension of 1 lb. of wettable sulfur in 1 gal. of water stimulated earlier rooting, advanced germination, and resulted in more vigorous and earlier flowering plants. This treatment of bulbs set outdoors in November increased earliness of spring growth, controlled root rot, and hastened flowering.

Growth-stimulating substances prevent shoot development on roses in storage, P. C. MARTIN. (U. S. D. A.). (*Amer. Nurseryman*, 76 (1942), No. 11, pp. 7-10, figs. 3).—Several materials when applied to dormant rose bushes in proper amounts and under proper conditions prevented shoot development while the plants were in common storage. Two methods of application were found effective, namely, the use of sprays containing the growth substance in dilute wax emulsion and vaporized chemicals placed in a tight container with the plants. Treated plants when moved to the field became established more quickly, largely because of a much more rapid root formation. Flowering was much better in the treated plants.

FORESTRY

American silvics and silviculture, E. G. CHEYNEY (*Minneapolis: Univ. Minn. Press*, [1942], pp. X+472, figs. 38).—This book was prepared by a member of the staff of the Minnesota Experiment Station.

Farm forestry in the Lake States: An economic problem, R. ZON and W. A. DUERR. (Coop. Univ. Minn.). (*U. S. Dept. Agr. Cir. 661* (1942), pp. 34, figs. 2).—Farm woodlands in the Lake States cover some 15 million acres or 29 percent of the entire forest land area. The farm woods fall into three broad belts—the western prairie, the southern woodland, and the northern forest. In the western prairie, woods are mostly in the form of sparse natural stands along streams and planted shelterbelts. In the southern area, the farm woods are woodlands in the true sense but are usually extensively grazed. In the north, woods occupy 43 percent of the average farm area and bring in 12 percent of the farm returns. Farm woods contribute more than one-half of all the timber cut annually in the Lake States. The value of the timber cut on farms amounts to \$44,000,000 per year and returns an average of \$2.92 per acre of woodland. It is estimated that with good management farm woodlands are capable of yielding annual returns of \$5 or more per acre.

[**Forestry studies by the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 429* (1942), pp. 12–13, fig. 1).—Included are reports on a saw timber survey in Clearfield County, by D. D. Stevenson and P. I. Wrigley, and on a study of the effect of the location and character of sugar maple trees on the sugar content of the sap, by Stevenson, W. E. White, and H. Triebold.

Possibility of simple biochemical tests for differentiation between species of genus Pinus, N. T. MIROV. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry*, 40 (1942), No. 12, pp. 953–954).—The identification of ponderosa pine and Jeffrey pine by means of simple colorimetric tests of their pitch is discussed, with comments as to the desirability of applying similar tests to other conifer species.

The establishment of a white birch community on cutover pulpwood land in northwestern Maine, H. J. OOSTING and J. F. REED (*Bul. Torrey Bot. Club*, 69 (1942), No. 9, pp. 647–660, figs. 2).—Studies in Oxford County, Maine, showed that during a 10-yr. period, following the complete removal of a mixed spruce-hardwood forest, a mixed stand dominated by white birch and including the typical species characteristic of the mixed spruce-hardwood forest of the Northeast had become established. White birch, pin cherry, yellow birch, and a limited amount of aspen together appeared to be most important in establishing the first canopy on certain clear-cut sites. Abundant balsam fir, red spruce, and white birch constituted the second layer of the young 10-year-old stands. Observations on a 54- to 60-year-old stand indicated that where white birch gains the ascendancy directly after cutting, it may constitute the important dominant for at least from 54 to 60 yr. After the removal of the mature white birch, this species is not found again until future treatments cause large openings in the forest in which are created a favorable environment for birch. Following the cutting of birch, there develops a typical mixed spruce-hardwood stand, with red spruce, red and sugar maples, and yellow birch as the major components.

Components of spruce and fir volume as influenced by cutting, A. B. RECKNAGEL and G. W. ABEL. (Cornell Univ.). (*Jour. Forestry*, 40 (1942), No. 12, p. 962).—A timber cruise in 1941 of northern New Hampshire forest stands, part of which was cut in 1890–92 and part in 1917–20, showed that the relative amount of balsam fir in the stands had increased as a result of the cuttings and

that the original volume had not yet been restored, even on the area cut 50 yr. before. On both of the cut-over areas, however, the stands were young and thrifty, whereas on nearly uncut areas the stand was stagnating.

Vital statistics for some Douglas-fir plantations, T. T. MUNGER. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 1, pp. 53-56).—Repeated observations on 12 plantations of Douglas fir established in 1915 and 1916 showed that, despite satisfactory initial survival on 10 of the 12 areas, losses continued and were still occurring. Some of the visible causes of death were drought, freezing, heat, snow injury, brush competition, and rodents and larger animals. Three of the better areas had losses of over 30 percent of their stands by 1941.

Fire as an ecological and silvicultural factor in the ponderosa-pine region of the Pacific slope, H. WEAVER (*Jour. Forestry*, 41 (1943), No. 1, pp. 7-14, figs. 4).—The advisability of complete prevention of forest fires in the ponderosa pine region of the Pacific slope is questioned because large areas are growing up to dense stands of white fir, Douglas fir, and incense cedar which prevent the less-tolerant ponderosa pine seedlings from becoming established. It is suggested that the dense stagnating stands of reproduction have aggravated the losses by western pine beetles as a result of competition with the larger trees for the limited soil moisture. When fires do occur, they are exceedingly destructive and tend to convert extensive areas into brush fields.

Effect of cutting mature lodgepole-pine stands on rainfall interception, C. H. NIEDERHOF and H. G. WILM. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 1, pp. 57-61, figs. 2).—A study, made in the summer of 1941 in north-central Colorado in a lodgepole pine type at an average elevation of 9,300 ft. and where summer rainfall occurs principally as small showers, showed that the amount of rainfall reaching the soil is materially influenced by cutting practices. On the commercially clear-cut plots 90.5 percent of the moisture reached the soil as compared with 68.3 percent on the virgin uncut plots. A chart and a formula are presented from which rainfall may be estimated for any given cutting treatment in storms of various intensities.

Drainage of forested swamps, R. B. LeBARRON and J. R. NEETZEL. (U. S. D. A. coop. Univ. Minn.). (*Ecology*, 23 (1942), No. 4, pp. 457-465, figs. 3).—Following the drainage of a swamp near Dukes, Mich., by the construction of two parallel ditches about 300 ft. apart, arbovitae trees located between the ditches accelerated their growth from two to four times. The vegetation following clear-cutting and draining was dominated by red maple and alder, an ecologically more advanced stage of succession than coniferous bog but of lower commercial value. If commercial species are expected, they must be present before the drainage is undertaken.

Effect of annual spring fires on stump taper of loblolly pine, H. H. CHAPMAN (*Jour. Forestry*, 40 (1942), No. 12, pp. 962-963).—Observations on a small area at Urania, La., which had been burned over several times to serve as a firebreak showed the loblolly pines in the burned area to have developed buttressed trunks, apparently as a protective reaction against recurring fires. The excess was confined to the portion of the trunk within 1 ft. of the soil.

Origin and development of oak stump sprouts as affecting their likelihood to decay, E. R. ROTH and G. H. HEPTING. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 1, pp. 27-36, figs. 2).—Studies in the George Washington National Forest, Va., showed that species of oak vary as to the age and size when sprouting capacity declines and also in the height growth of sprouts. Sprouts arising lowest on the parent stump were less likely to develop butt rot from the old stump. The tendency for sprouts higher up on the stump to become dominant argues for their early elimination and the encouragement of sprouts of lower

origin. The most effective improvement measures are those undertaken when the stand is less than 20 yr. of age, preferably in the 8- to 15-yr. stage.

DISEASES OF PLANTS

The Plant Disease Reporter, [December 1 and 15, 1942] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 26 (1942), Nos. 22, pp. 469-485; 23, pp. 487-512, figs. 4).—In addition to the host-parasite check list revision, by F. Weiss (No. 22, *Vaccinium*, and 23, *Viburnum* to *Vitis*, the following are included:

No. 22.—Spread of the common tobacco-mosaic virus in tomato fields by means of vine lifters, by M. B. Linn and H. W. Anderson; early appearance of late blight of potato in Oregon in 1942, by C. E. Owens; diseases of soybeans and peanuts in Mississippi, by J. A. Pinckard; cotton boll rots and the fungi associated with them in Oklahoma in 1942, by W. W. Ray; the rate of application of Ceresan to cottonseed, by W. W. Ray; preliminary evidence suggests guayule may be resistant to the root knot nematode, by W. G. Hoyman; tobacco diseases in Maryland in 1942, by E. A. Walker; and small grain diseases in Virginia, 1942, by S. B. Fennee.

No. 23.—*Phytophthora infestans* was destructive on tomatoes in New York State during 1942, by G. L. McNew; 1942 vegetable diseases in New Jersey as affected by the weather, by C. M. Haenseler; *Helminthosporium turcicum* leaf blight of corn in West Virginia, by E. J. Wellhausen; control of dollar spot in Minnesota, by I. W. Tervet; grass diseases in Wisconsin in 1942, by J. L. Allison and D. W. Chamberlain; red clover diseases in Wisconsin in 1940-41-42, by J. L. Allison; peanut diseases in certain south Texas counties in 1942, by G. KenKnight; and brief notes on *Verticillium* wilt of cotton in Oklahoma, *Phytophthora infestans* on the weed *Solanum sarachoides*, and *Septoria* leaf spot on celtuce in Illinois.

Abstracts of papers accepted for presentation at the thirty-fourth annual meeting of the [American Phytopathological] Society, New York, N. Y., December 28 to 31, 1942 (*Phytopathology*, 33 (1943), No. 1, pp. 1-20).—Abstracts of 87 papers relating to plant diseases and/or their control.

[Plant disease studies by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt. 1942*, pp. 13-14, 18-19, 25, 26-27).—Included are statistics on fungi identified for plant disease fighters; and brief reports on defense housing, aircraft, and boat decay; resistant strains for controlling forest-tree diseases; a cotton disease survey; immunity of *Crotalaria spectabilis* to root knot; curly top virus studies; urea as a soil disinfectant; a new fungicide for tobacco blue mold; and increases in *Fusarium* wilt and root knot on tobacco following sweetpotato as compared to healthier tobacco following peanuts.

[Phytopathological work by the Georgia Station]. (Partly coop. U. S. D. A., Ga. Coastal Plain Expt. Sta., et al.). (*Georgia Sta. Rpt. 1942*, pp. 68-69, 70-73, 75).—Brief progress reports are given on diseases of muscadine grapes, fungicidal dusts for peanut leaf spots, peanut seed treatment, the major diseases of snap beans and breeding for resistance to them, and diseases of Austrian Winter field peas, vetches, lupines, lespedezas, and cowpeas.

[Progress reports on plant disease studies by the Kansas Station]. (Partly coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1941-42*, pp. 49-52).—Included are studies of diseases of cereals, forage crops, fruits, and vegetables; combined resistance of winter wheat to leaf and stem rust races; and breeding for disease resistance in wheat, oats, and sorghum.

[Studies of plant diseases by the Montana Station], H. E. MORRIS (*Montana Sta. [Bien.] Rpt. 1941-42*, pp. 19-24).—Progress is briefly reported for studies of

wheat bunt and control methods (including resistant varieties), seed treatment for oat smuts, mosaic control in Great Northern beans, and diseases of sugar beets (seedling diseases or "black rot," and phosphate and nitrogen deficiencies) and their control.

[Progress in phytopathological studies by the Oregon Station]. (Partly coop. U. S. D. A.). (*Oregon Sta. Bul.* 401 (1941), pp. 38-39, 39-40, 41-42, 48, 58-59, 63, 68, figs. 2).—Brief reports are included on virus stoney pit disease of pear, viruslike leaf mottling and chlorosis of orchard trees, physiological (?) bud blight of cherry, control of leaf spot and brown rot of cherry, and control of pear scab and storage rot; crinkle, red stele, and stunt (new virus disease) of strawberry, crown degeneration of Cuthbert raspberry, stamen blight of blackberry, and dwarf disease of loganberry; cereal smuts; potato nematode, scab, and virus problems; tomato tip blight and curly top resistance in vegetable crops; and diseases of ornamental nursery stock and of bulbs and ornamental plants.

[Plant disease research in Pennsylvania] (*Pennsylvania Sta. Bul.* 429 (1942), pp. 11, 25).—Tests by H. W. Thurston indicated the possible value of substitute copper sprays for bordeaux against blight and by C. C. Wernham the control of hot weather grass disease with Spergon.

A simple technique for isolating spores of various fungi from exposed slides in aerobiological work, W. J. MARTIN. (Minn. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 1, pp. 75-76).—The technic described involves use of the low power of the microscope for marking the location of a spore or group of spores on an exposed slide with a crow-quill pen and India ink. The slide is then inverted over a Van Tieghem cell and single spores are isolated with a glass needle and micromanipulator, and placed on sterile agar drops. By this method spores of the following fungi which are not morphologically distinctive enough for identification, were isolated and identified: *Penicillium*, *Aspergillus*, *Trichoderma*, *Cephalosporium*, *Fusarium*, *Cladosporium*, *Rhizopus*, and *Pleospora*.

An analysis of factors causing variation in spore germination tests of fungicides.—IV, Time and temperature, R. H. WELLMAN and S. E. A. McCALLAN (*Contrib. Boyce Thompson Inst.*, 12 (1942), No. 6, pp. 431-449, figs. 5).—Continuing the series (E. S. R., 86, p. 340), in determining the effect of time in the spore germination methods of fungicidal assay, toxicity curves were established for CuSO_4 , ZnCl_2 , "Standard Laboratory Bordeaux," red cuprous oxide, and two synthetic organic chemicals on four fungus species after various periods of elapsed time and under different temperatures. A linear relation between reciprocal of elapsed time and germination expressed in probits was shown for *Sclerotinia fructicola*, *Glomerella cingulata*, *Alternaria solani*, and *Macrosporium sarcinacforme* spores germinating in water at 10°, 15°, 21°, 27°, and 35° C. Temperature markedly affected the spore germination rate in these fungi in water, but all attained 98 percent or above by 50 hr. at all temperatures, except the first two at 35° where it was about 90 percent. Optima for each fungus are given. No significant difference in precision could be shown between counts made at 6, 12, 24, 48, or 96 hr. A linear relation between reciprocal of elapsed time and germination expressed in probits occurred when spores were germinated in a given concentration of a chemical, provided it permitted germination. The action of elapsed time in fungistatic tests is the reverse of the usual action of time in toxicity tests at a given concentration, and in such tests inhibition of germination becomes less as time passes since the spores continue to germinate and thus give indication of viability. A linear relation is also shown for LD50 values when the logarithm of concentration is plotted against recip-

rocal of elapsed time. This curve is important in assaying a fungistatic agent, since compounds are rated differently at various times on the same fungus and fungi may differ in relative susceptibility to a compound with time elapsed before counting. Slopes of dosage-response curves did not differ significantly for the various times of counting, provided appropriate correction was made for control germination.

Determining temperature effects other than optimum on fungistatic action involves a system where two toxicants, i. e., chemical and temperature, act simultaneously. Interpretation is simplified if the variable time is held constant by determining LD values after 20 hr. or more of elapsed time, when the chemical has approached equilibrium with respect to time. No significant LD50 differences could be demonstrated at 15°, 21°, or 27°, but there was a temperature effect at 10° and 35°. Compounds were not rated in the same order at 10° and 35°, but in general it took less chemical to attain LD50 at these extremes. It took proportionately more chemical to give LD50 on *A. solani* at the higher temperatures and on *S. fructicola* at the lower. In germination tests where 20 hr. or more elapsed before counting, temperature need be controlled only within about 5° above or below the germination optimum. In a general way, time of counting and extreme temperatures are believed as important sources of variation in fungistatic tests as is the difference in fungus susceptibility.

Revisionary studies in the tropical American rusts of *Panicum*, *Paspalum*, and *Setaria*, G. B. CUMMINS. (Ind. Expt. Sta.). (*Mycologia*, 34 (1942), No. 6, pp. 669-695, figs. 23).—This paper presents the results of a taxonomic study of 14 species of the Uredinales—*Uromyces* and *Puccinia* (2 new species)—parasitic on these three grass genera. There are 18 references.

Protoplasmic continuity in the powdery mildew *Erysiphe graminis* DC., II. J. BRODIE (*Canad. Jour. Res.*, 20 (1942), No. 12, Sect. C, pp. 595-601, figs. 16).—By a technic described, the protoplasm of the mycelium and conidiophores of this barley mildew fungus was found continuous from cell to cell through pores in the septa.

Physiologic specialization in *Cercospora oryzae*, T. C. RYKER. (La. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 1, pp. 70-74, fig. 1).—This reports 5 main races of the rice leaf spot fungus which could be further subdivided into 16 subraces. These races were differentiated on size of lesions and length of incubation period on 8 rice varieties. Certain varieties were found resistant to all known races, but Blue Rose, the one most widely planted in Louisiana, proved susceptible to most races known in the State. A selection of this variety is resistant to race 1, which is the most common form there.

New varieties of spring wheat resistant to stem rust in the Canadian west, and their genetical background, K. W. NEATBY (*Empire Jour. Expt. Agr.*, 10 (1942), No. 40, pp. 245-252).—The author reviews (21 references) the genetics of resistance in wheat to stem rust, the results of comparative field tests, sources of breeding material, and the distribution of resistant varieties in the Canadian prairie provinces.

Doenças de mandioca no nordeste [Diseases of cassava in the northeast (Brazil)], J. A. DESLANDES (*Bol. Min. Agr. [Brazil]*, 30 (1941), No. 2, pp. 23-41, figs. 17).—A brief compendium on the diseases and their control, including those due to bacteria, fungi, viruses, mites, nematodes, and dodder.

The effect of cotton seed dusting on emergence of seedlings in soil infested with *Rhizoctonia*, W. W. RAY. (Okla. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 1, pp. 51-55).—In tests involving seed treatment with various fungicidal dusts and planting in soil abundantly infested with *R. solani*, the chemicals regularly giving emergences significantly greater than those of non-

treated controls were New Improved Ceresan (ethyl mercury phosphate), DuBay 1155-HH (ethyl mercury iodide), DuBay 740-A (ethyl mercury borate), DuBay 1228-R (methyl mercury naphthol sulfamide), and Spergon (tetra-chloro-para-benzoquinone), but the differences in subsequent survival from treated and nontreated seed were not statistically significant. The results thus indicate that seed treatment is not an effective means of controlling post-emergence damping-off of cotton by *Rhizoctonia* when the soil is heavily infested.

Las enfermedades del algodónero en la Republica Argentina [Cotton diseases of Argentina], M. A. DI FONZO (*Argentina Min. Agr., Junta Nac. Algodón, Bol. Mens. No. 80 (1941), pp. 951-978, figs. 28; also [Pub.] No. 58 (1942), pp. [3]+30, figs. 28*).—This conspectus (illustrated partly in color) includes diseases due to cryptogams and nematodes and abnormal conditions ascribed to meteorological and physiological causes. Control methods discussed include plant and seed treatments and H_2SO_4 delinting of the seed. Instructions for preparing and sending specimens are included.

Principales enfermedades que se presentan en el cultivo de la papa en Panamá [Principal potato diseases in Panama], J. I. MARTINEZ MORENO (*Rev. Agr. y Com. [Panama], 1 (1941), No. 1, pp. 47-53, figs. 5*).—A brief conspectus of the diseases and their control, with bibliography.

Diagnosis of the bacterial ring rot of the potato, W. H. BURKHOLDER (Cornell Univ.). (*Amer. Potato Jour., 19 (1942), No. 10, pp. 208-212*).—The difficulties in diagnosing *Corynebacterium sepedonicum* (= *Phytophthora sepedonica*) and various published laboratory procedures are reviewed (9 references). It is concluded that if one is familiar with potato diseases in the living plant, ring rot can in most cases be diagnosed by symptoms alone. Where there is some doubt, macroscopical examination under ultraviolet light and microscopical examination for the gram reaction and bacterial morphology should enable a satisfactory conclusion, but any one test alone is insufficient for definite proof.

Potato virus diseases: Review of literature, 1941, T. P. DYKSTRA. (U. S. D. A.). (*Amer. Potato Jour., 19 (1942), No. 12, pp. 267-279*).—With 28 references.

Tuber-line seed plots, D. FOLSOM. (Maine Expt. Sta.). (*Amer. Potato Jour., 19 (1942), No. 11, pp. 225-229*).—Tuber lines were helpful but insufficient for developing mosaic- and leaf roll-free seed stocks in Maine. When such stocks were planted in seed plots, there was about a 50-50 chance that disease would enter them. Mosaic control was favored by location outside the northeastern part of the State, by earliness, and by larger size and better isolation of seed plots. Leaf roll control was favored by location in the northeastern part of the State, by earliness, and by larger size of seed plots. The effects of these factors were often greater than the effects of tuber-unit planting.

A strain of the tuber blotch virus causing top necrosis in potato, P. E. M. CLINCH (*Roy. Dublin Soc., Sci. Proc., n. ser., 22 (1942), No. 46, pp. 435-445, pl. 1*).—A "top necrosis element" was found in certain units of the stock cultures in President potato of interveinal mosaic, previously shown to be a mixture of viruses F (tuber blotch) and X. As the parent plant of the clone and other units arising from it were free from this element, it was assumed to be a contaminant. Removal of X from interveinal mosaic showing top necrosis yielded a supposed complex of the top necrosis element and virus F, referred to as virulent tuber blotch. The last, inoculated into 32 potato varieties gave 18 killed by top necrosis and 14 with a mild reaction identical with that of virus F. The reactions of 8 other solanaceous hosts, as well as the physical properties of virulent tuber blotch virus, proved similar to those of virus F. Evidence is presented that the top necrosis element is not related to potato viruses B, C, or D, which also cause top

necrosis. *Myzus persicae* failed to transmit any virus from this variety infected with virulent tuber blotch alone, but in the presence of A (a condition necessary for transmission of F), virulent tuber blotch, as such, was transmitted in a single case. Potato plants infected with virus F were immune to virulent tuber blotch, and virus G (aucuba mosaic) and virulent tuber blotch were also mutually protective. It is concluded that virulent tuber blotch is a strain of virus F (= *Solanum* virus 8 = *Marmor aucuba*), which arose spontaneously from the latter within the plant tissues. By its recognition the Koch and Johnson "potato streak" virus (E. S. R., 74, p. 502) is identified. Cases of virus strain conversion in the literature are discussed. There are 22 references.

The identity of the top-necrosis in Up-to-Date potato, P. E. M. CLINCH (*Roy. Dublin Soc., Sci. Proc., n. ser., 23 (1942), No. 4, pp. 18-34, pl. 1*).—Of 39 potato varieties tested, the majority reacted with top necrosis when grafted with scions from "streak"-carrying Up-to-Date potato. Sap inoculation of streak virus (=virus B = *Solanum* virus 4) from Up-to-Date to healthy potatoes of intolerant varieties resulted in local necrotic lesions rarely becoming systemic. It was easily transmitted to tolerant varieties. Sap inoculation from Up-to-Date to *Datura stramonium*, tobacco, tomato, or *Lamium hybridum* resulted in mild mosaic symptoms characteristic of virus X. All attempts to infect X-immune seedling 41956 with a virus from Up-to-Date or with virus X failed, though the variety was readily infected with potato viruses unrelated to X. When this seedling was inserted as an intermediate scion between Up-to-Date and a susceptible basal stock, the virus content of Up-to-Date passed unchanged into the basal stocks. In similar double grafts in which Up-to-Date was replaced by X-infected President as top scion, no resistance was offered by the intermediate 41956 scion to downward passage of X, though the latter scion failed to become infected with X or any virus from Up-to-Date. Removal of X from Up-to-Date sap resulted in a simultaneous removal of the virus responsible for streak. The physical properties of the Up-to-Date streak virus proved similar to those recorded for X-type viruses. The streak virus could not be introduced by sap inoculation to potato or *Datura* already infected with virus X, but the immunity of X-infected plants to the streak virus or to other strains of X did not hold if the second virus was introduced by graft. After inoculation with streak sap from Up-to-Date, healthy potatoes of intolerant varieties occasionally developed systemic infection with a nonnecrotic X virus, whereas similar plants inoculated with a mixture of streak and X-infected saps all developed systemic X infection. It is concluded that the streak virus in Up-to-Date potato is a strain of virus X differing from typical X only in its effects on certain potato varieties. Pertinent related data are discussed. There are 26 references.

"Stem end browning" and "net necrosis" in potatoes, H. T. GUSROW (*Amer. Potato Jour., 19 (1942), No. 12, pp. 280-282*).—A brief discussion of the significance of these two disease entities, followed by the advice that until the causes are definitely ascertained the safe procedure is to plant no seed potatoes showing the slightest evidence of either.

The production of virus-free potatoes in the south-west of England, J. CALDWELL (*Ann. Appl. Biol., 29 (1942), No. 3, pp. 265-267*).—Preliminary surveys followed by field trials in certain isolated districts led to the conclusion that large quantities of seed potatoes could readily be produced in three main areas and probably in many more, and in many cases under conditions least suited to other forms of agricultural activity.

The severity of potato scab in relation to the use of neutralized and one-third neutralized fertilizers, H. T. COOK and G. V. C. HOUGHLAND. (Va.

Truck Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour.*, 19 (1942), No. 10, pp. 201-208, fig. 1).—The evidence presented is believed to show that the neutralized and one-third neutralized fertilizers used continuously for 7 yr. ultimately affected the occurrence and amount of potato scab principally through their effects on the degree of acidity of the soil.

The amount of boron absorbed by soybean plants and its effect on their growth, W. S. HODGKISS, R. H. HAGEMAN, and J. S. MCHARGUE. (Ky. Expt. Sta.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 652-660, fig. 1).—Short-term growth studies on soybeans indicated that a 20-day growth period with 12-day treatment suffices for demonstrating boron toxicity both by growth relationships and by foliar symptoms. Toxicity as shown by foliar symptoms corresponded to the presence of 200 p. p. m. or more of B in the moisture-free material. Duplication of growth maxima in four plant series in sand and sand-soil mixtures and treatment with varying amounts of B appeared to furnish conclusive proof that such maxima occur at 0.4 and 0.8 p. p. m. added B at this stage of soybean growth. Preliminary field tests indicated a growth change corresponding in effect to that in the greenhouse work. The B concentration of field-grown soybeans at midseason showed little difference among treatments, but at earlier and later growth stages the concentration had increased with treatment. This procedure offers a method for testing small amounts of soil for B toxicity in a relatively short time.

The iron-manganese relation in plant metabolism, I. I. SOMERS and J. W. SHIVE. (N. J. Expt. Stas.). (*Plant Physiol.*, 17 (1942), No. 4, pp. 582-602, figs. 6).—In tests with soybean in solution culture at 3 Fe levels at each of which the Mn concentrations were varied through a relatively wide range, pathological symptoms produced by excess Fe were identical with those in Mn deficiency, and vice versa. The Fe:Mn ratios in the nutrient corresponding to good growth and normal development fluctuated within a narrow range around 2.0, regardless of the total concentrations of these elements within the limits used. The Fe:Mn ratio values above this effective range invariably produced a specific type of chlorosis resulting from excess Fe or deficient Mn, or both; ratios below this, a specific chlorosis of a different type resulting from excess Mn or deficient Fe, or both. Ratios of soluble Fe to soluble Mn within the tissues associated with good growth and development covered the same range of values as those in the external medium, though the range of effective values might be somewhat wider in plant tissues than in the substrate. Variation in the ratios of the soluble fractions either above or below this effective range resulted in specific pathological symptoms. High concentrations of soluble Mn in the tissues were invariably associated with low concentrations of soluble Fe, and vice versa. This suggests the oxidation of ferrous to ferric ions by active Mn, resulting in the inactivation and precipitation of Fe in the form of ferric organic complexes. In their metabolic functions, Fe and Mn are definitely interrelated, the biological effectiveness of the one being determined by the proportionate presence of the other. There are 20 references.

Resistance of tobacco to bacterial wilt (*Bacterium solanacearum*), E. E. CAYTON and T. E. SMITH. (U. S. D. A., N. C. Expt. Sta., et al.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 12, pp. 547-554, figs. 3).—Search for resistance to *Phytophthora* was begun in 1934. None of the wild *Nicotiana* species tested showed resistance, but of 1,034 collections of *N. tabacum* (chiefly from Mexico and Central and South America) a very few were resistant. By crossing two moderately resistant strains, T. I. 79A and Turkish Xanthi, a highly resistant genotype (79-X) was developed, though it is a very poor type of tobacco. A highly wilt-resistant collection of good type (T. I. 448A) was obtained from Colombia, this strain over a 3-yr. period always showing less than 10 percent mortality,

even though disease conditions were so severe that susceptible tobacco was completely destroyed. It was also highly resistant to common tobacco mosaic.

Viscosimetric studies on the tobacco mosaic virus protein, II, V. L. FRAMPTON. (Cornell Univ.). (*Arch. Biochem.*, 1 (1942), No. 1, pp. 83-92, figs. 4).—Following the demonstration of anomalies in the viscosity of this virus nucleoprotein (E. S. R., 81, p. 662), this study shows that the degree of anomaly is greatly increased in presence of dilute KCl, the flow of the virus nucleoprotein sol through a capillary tube is discontinuous, and the degree of thixotropy rises with decreasing pH. There are 26 references.

Effect of water extraction from leaves of tobacco on acyl derivatives of the protein of tobacco mosaic virus, P. AGATOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 33 (1941), No. 2, pp. 170-171).—Since the acyl derivative of this virus protein was not found of usual occurrence in the plant, it is believed that the enzyme system of the plant is unfitted to break up so stable a compound easily and quickly. Hence an acylated molecule of the virus protein appears capable of forming the virulent substance without preliminary hydrolysis of the acyl groups.

Effect of cyanide on synthesis of ring-spot and mosaic viruses in tobacco, M. W. Woods. (Md. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 1, pp. 77-80, fig. 1).—The influence of 0.00015 to 0.0003 M KCN on synthesis of virus proteins of ring spot (*Annulus tabaci*) and two strains of tobacco mosaic (*Marmor tabaci*) was determined by a detached leaf technic. It was possible to follow simultaneously the development of two viruses in sectors of a single leaf under four different experimental conditions. At the concentrations used, KCN inhibited part of the O_2 respiration in the susceptible cell and the synthesis of all three viruses. The effect was also reversible. When ring spot-inoculated tissues were treated with KCN at night only, the cells became permanently resistant to necrotic action of the virus. An external supply of NO_2 influenced the symptom picture produced by each virus.

Use sphagnum to control damping-off, P. P. PRONE (*New Jersey Stas. Nursery Disease Notes*, 15 (1942), No. 5, pp. 17-20).—In view of the need for conserving fungicidal chemicals, attention is called to the value of a layer of shredded sphagnum in seed flats and coldframes as shown by experience of florists and nurserymen and observations by the author.

Boron for preventing breakdown in beets, A. G. B. BOUQUER. (Oreg. State Col.). (*Canning Age*, 23 (1942), No. 12, pp. 633-635, fig. 1).—A brief summary of data on this physiological trouble and its control not only in beets but also in carrots, celery, crucifers, and in other vegetables. Lists of sensitive and tolerant crops are included.

Genes for resistance to powdery mildew in *Cucumis melo*, T. W. WHITAKER and D. E. PRYOR. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 270-272).—Inclusive of new data here presented, the evidence appears to justify carrying forward a number of lines of cantaloup on the ground that a few will contain a full complement of resistant genes, to render advisable the collecting of the fungus *Erysiphe cichoracearum* from a wide range of localities for testing as many biotypes of the pathogen as possible, to demonstrate the importance of maintaining collections of material from areas in which the host species is endemic, and to emphasize the importance of rigorous testing of material in both greenhouse and field. All these steps are especially needed because of the problem of variation in two organisms—the host and the parasite.

Disease symptoms in lettuce and celtnuce, caused by the bean leaf hopper *Empoasca solana* [solani] Del., J. P. MARTIN and C. E. PEMBERTON (*Hawaii. Planters' Rev. [Hawaii. Sugar Planters' Sta.]* 46 (1942), No. 3, pp. 111-118,

figs. 8).—This disease, described on lettuce and celtnce with the symptoms also recorded on endive, appears to be the first report for the Hawaiian Islands. It is concluded on experimental evidence that the injury results from a toxic secretion by the leafhopper into the leaf during its feeding, the degree of injury varies directly with the insect population, affected plants recover after the insects are removed, and control will be in direct proportion to leafhopper control. The disease is a form of hopperburn.

Pathogenesis of *Ditylenchus dipsaci* in seedlings of *Allium cepa*, A. G. NEWHALL. (*Phytopathology*, 33 (1943), No. 1, pp. 61–69, *figs. 2*).—Through a study of paraffin sections of onion seedlings up to 12 days old and lifted at 2-day intervals from heavily infested soil, the nematode was found to penetrate the seed soon after germination commenced and to live for a short time in the parenchyma tissues beneath the hilum or in the cotyledon. Penetration of the cotyledon after its protrusion apparently could take place directly through the young epidermis. Once within the sprout longitudinal and radial migration occurred freely through the cortical tissue but was definitely bounded by dermal layers even at early germination stages. No evidence of penetration of the provascular strand was observed. Evidence that this nematode migrates only between the cells by dissolving the middle lamella was meager and unconvincing, but indications of destructive mechanical intracellular penetration of parenchyma tissue were abundant. Further data are presented showing that as seedlings reach the age of 3 weeks they become more resistant to attack in the soil. This may be due to probable increased hardening of the epidermis.

Etude biologique de *Puccinia allii-phalaridis* Klebahn [Biological study of *P. allii-phalaridis*], E. MAYOR (*Ber. Schweiz. Bot. Gesell.*, 51 (1941), pp. 313–320).—Includes data on inoculations of this rust into various species of *Allium*.

Control of tomato diseases (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 4, p. 8).—Hybrids from crossing the wild Peruvian tomato with the Stone and Century varieties were found to have resistance to *Verticillium* wilt. Progress was also made in the breeding of tomatoes (in cooperation with the U. S. Department of Agriculture) for resistance to curly top, but to date the cultural practice of setting tomato plants more closely in the field was the most effective approach to control of this disease. Close planting reduced the amount of disease and increased total yields. Direct seeding in the field and early planting were also beneficial.

New crystalline forms of tomato bushy stunt virus, S. S. COHEN (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 104–105, *figs. 2*).—The finding of two more crystalline forms of this virus is believed to emphasize again its relationship to many of the simpler proteins, which are expected to behave according to chemical and physical laws.

Experimental control of damping-off in tomato seedlings transplanted from sand, including the immediate application of fungicidal drenches, W. S. BEACH and S. Y. CHEN (CHAN) (*Pennsylvania Sta. Bul.* 434 (1942), pp. 26, *figs. 4*).—No significant evidence was found that lack of balance or omission of certain nutrient elements affects susceptibility of tomato seedlings to damping-off in sand cultures, or that there are differences between properly grown seedlings in sand culture v. steamed soil after transplanting to infested soil. However, overconcentration of nutrient salts resulting in chemical injury increased susceptibility. Washing the sand in hot water is thus essential for each seedling crop to remove excess soluble salts and organic matter as well as to destroy fungi. Reduction of the moisture in seed flats did not appreciably affect resistance if seedlings were transplanted soon after emergence. Extra K_2SO_4 slightly increased resistance but a high moisture level was required to avoid chemical

injury. After transplanting, seedlings were highly susceptible to *Pythium ultimum* for about 3 days and to *Rhizoctonia solani* for a much longer or an indefinite period. Thorough drying of *Pythium*-infested soil largely prevented damping-off of transplanted seedlings, as their highly susceptible period was passed before sufficient mycelial development for attack. Environmental factors favoring prompt renewal of turgor and growth reduced infection. Under conditions of moderate disease, reducing losses by about half proved possible through use of sand or steamed soil as compared with untreated soil, but in averting severe losses, prevention of conditions favoring development of the pathogens in the transplanting soil is far more important than resistance or source of seedlings. In absence of other preventive measures, safe and effective control in transplanted seedlings proved possible through applying comparatively weak drenches of CuSO_4 , Seme-san, or Spergon to prepared flats of soil just before or after transplanting.

A septoriose do tomateiro [Tomato septoriose], J. SOARES BRANDÃO, JR. (*Bol. Min. Agr. [Brasil]*, 30 (1941), No. 11, pp. 19-21).—A note on *Septoria lycopersici* and its control.

Sulphur and copper sprays in relation to apple-tree growth and yield, H. W. THURSTON, JR., and H. N. WORTHLEY. (Pa. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 1, pp. 56-60, figs. 2).—When Stayman apple trees were differentially sprayed (1936-41) with standard lime sulphur and lead arsenate v. copper phosphate-lime bentonite and lead arsenate v. unsprayed controls, trunk circumference records indicated a close negative correlation with yields, the loss of crop on unsprayed trees being reflected in increased growth. No cumulative injurious effects from continued use of the sprays were observed.

Estudio de la naturaleza de las ramas del duraznero (*Prunus persica* Sieb. et Zucc.) y su relación con la gomosis [Studies of the nature of peach twigs and its relation to gummosis], J. C. BERTELLI (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 14 (1942), No. 3, pp. 43-89, figs. 8; *Eng. abs.*, p. 87).—Following descriptions of the methods of technic used and the substances of which the normal tissues are composed, the results are presented of studies of peach-twig sections grown in the fall, in the spring and less than a year old, and of those over a year old, and in addition observations of living twigs placed in alkaline or acetified solution. From this work it is concluded that the gummy exudation from peach twigs and branches is due to the degradation of the hemicellulose, hydrocellulose, and pectic substances of the cellular membranes in the bark, pericycle, wood, and pith, as well as of the cell contents of these tissues, together with a hyperplastic process causing formation of gelatinous cells by the cambium.

Peach wart, E. C. BLODGETT. (Idaho Expt. Sta.). (*Phytopathology*, 33 (1943), No. 1, pp. 21-32, figs. 3).—This virus disease of peach, first described by the author in 1939 (*E. S. R.*, 81, p. 655), is now reported only from Idaho, Washington, and Oregon, along with the progress of investigations of the past 5 yr. It is characterized by smooth or rough outgrowths of fruit tissue, and gumming is usually present and often severe. The virus is readily transmitted by budding and persists in the tree. Peach is the only known host. Spontaneous spread, although slow, takes place. The virus has been tentatively named *Galla verrucae*, although little is known of its characteristics. Control is by eradication of diseased trees and use of healthy propagating wood.

Citrus decline in the Murrumbidgee Irrigation Area: Importance of *Phytophthora* root rot, L. FRASER (*Agr. Gaz. N. S. Wales*, 53 (1942), No. 9, pp. 415-419, figs. 2).—The progressive decline in the condition of citrus trees in orchards of this New South Wales area during the past 8-10 yr. is shown to be due in part to attacks of the fibrous and even main roots by *P. citrophthora*. The factors which have led to the building up of high concentrations of this fungus

in the soil are discussed, and suggested management methods for control are outlined.

Cinchona production, A. G. KEVORKIAN (*Puerto Rico Sta. Rpt. 1944*, pp. 9-10).—A brief note on a virus disease, a fungus-induced stem canker, and two root diseases definitely established as important limiting factors in the development of vigorous trees of *Cinchona* spp.

A chlorosis and necrosis of tung leaves associated with low potassium content, M. DROSDOFF and J. H. PAINTER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 45-51, fig. 1).—The effect of mulch in increasing the K content of the leaves and in preventing the development of the interveinal chlorosis is believed to support the hypothesis that the condition here described is the result of K deficiency. There are 16 references.

"Heterosporium echinulatum" (Berk.) Cke., nuevo parasito del clavel ("Dianthus caryophyllus") en la Republica Argentina, M. D. CAMPI (*Lilloa*, 8 (1942), No. 1, pp. 269-271, pl. 1, fig. 1).—Recorded for the first time in Argentina, this fungus was troublesome for carnations under glass.

A leaf-spot of Hibiscus sp. induced by Phytomonas syringae, C. O. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 33 (1943), No. 1, pp. 82-84, fig. 1).—Water-soaked brownish or blackish spots 1-10 mm. in diameter on the leaves of hibiscus in California were proved due to *P. syringae*. Inoculations through wounds in lemon fruits and in the leaves of hibiscus and lilac gave typical black necrotic lesions, and a culture isolated from black pit of lemon caused lesions in hibiscus typical of the spontaneous disease.

Erwinia carotovora, the cause of a soft rot in orchids, *Cattleya* sp., D. P. LAMBER and B. A. FRIEDMAN. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 1, pp. 80-82, fig. 1).—Spontaneous infection of cattleyas in two New Jersey orchid houses and successful inoculations on excised leaves of *Oncidium*, *Odontoglossum*, *Brassavola*, and *Lockhartia* are reported.

Ring spot on Saintpaulia, G. H. POESCH. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 381-382).—Preliminary trials to determine the cause of the fantastic bright yellow ring patterns developing on leaves of greenhouse grown *S. ionantha* which have been troubling commercial growers appear to indicate a role of overhead irrigation with water considerably cooler than the temperature of the leaves.

Fusiform rust control in forest-tree nurseries, B. SLEETH (*Phytopathology*, 33 (1943), No. 1, pp. 33-44, fig. 1).—Effective but not complete nursery control of *Cronartium fusiforme* was obtained by spraying. Of three fungicides used, bordeaux (8-8-100) appeared most effective, Copper Hydro slightly less so, and dry lime-sulfur least effective. Both Santomerse S and an emulsion of raw linseed oil and liquid fish-oil soap gave good results, slightly better than casein, as spreaders. An oak-free zone 1,500 ft. wide failed to show perceptible reduction of rust in slash pine seedlings. Mid-April-sown slash pine showed only three-fifths as many fusiform-rust cankers as that sown a month earlier. Less infection occurred in loblolly than in slash pine sown on the same date and comparably grown, and longleaf pine seedlings proved still more resistant. Neither para- nor ortho-toluenesulfonylamide, applied to the soil surface at about the time of peak sporidial production, gave any reduction in cankered seedlings.

Distribution patterns in Melampsorella in the national forests and parks of the Western States, S. M. PANDY (*Mycologia*, 34 (1942), No. 6, pp. 606-627, figs. 3).—Further evidence (E. S. R., 87, p. 530) for the existence of two species of *Melampsorella* was obtained from this study of their distribution on the *Abies* and *Picea* hosts and in some 18 national forests and parks of the United

States (1941), involving 75 collections and over 150 detailed observations. In practically every area one or the other fungus species was dominant even though both hosts were abundant, indicating that the two differ in physiology as well as in morphology. Two distinct distribution patterns were thus obtained. In the Rocky Mountain States where the two hosts are abundant the disease was found more severe than hitherto believed, many trees being partially or completely killed and others dwarfed or stunted. In some Wyoming areas it was of epidemic proportions. Trunk infections were particularly harmful and in young trees soon caused their death. Differences in growth habits inducing compact brooms in *Abies* and irregular diffuse brooms on *Picea* were a constant and fairly reliable character and are believed due to apical dominance, which is present in *Picea* spp. and absent in *Abies* spp.

Chemotherapy for vascular diseases of trees, J. G. HORSEFALL and G. A. ZENTMYER. (Conn. [New Haven] Expt. Sta.). (*Natl. Shade Tree Conf. Proc.*, 17 (1941), pp. 7-18).—A general address on the subject, with bibliography and discussion.

Stand improvement of northern hardwoods in relation to diseases in the Northeast, W. A. CAMPBELL and P. SPAULDING (*U. S. Dept. Agr., Forest Serv., Allegheny Forest Expt. Sta. Occas. Paper* 5 (1942), pp. [2]+25, pls. 9).—Attention is called to certain fungus diseases hampering the production of profitable crops of northern hardwoods (sweet birch, paper birch, yellow birch, red maple, sugar maple, American beech, black ash, American ash, American basswood, black cherry, quaking aspen, and bigtooth aspen) in the northeastern United States, and it is shown how timber stand improvement operations can be directed toward reducing these losses. Detailed discussions concern such matters as estimating disease cull and the average cull to be expected, distribution of cankers and rots by tree age and species, the sprout problem, and the specific diseases and fungi themselves. Brief reference is made to burls and stains.

Occurrence of *Gonatorrhodiella highlei* in Nova Scotia and New Brunswick, J. EHRLICH (*Mycologia*, 34 (1942), No. 6, p. 705).—A note on this fungus growing in association with *Nectria coccinea* and the woolly beech scale (*Cryptococcus fagi*) on diseased American beech (*Fagus grandifolia*) in Canada.

The behavior of *Endothia parasitica* on chestnut trees in California, M. R. HARRIS (*Calif. Dept. Agr. Bul.*, 31 (1942), No. 3, pp. 99-109, figs. 6).—Chestnut blight, known to have been in California since 1934, has spread from one orchard to two others in the San Joaquin Valley, but the spread has been slow as compared with that in the Eastern States. All infected trees in these orchards were destroyed, and those subsequently developing infection were similarly treated at two annual inspections. Most of the cankers were found at the base of the tree. Earthen dikes to protect against infection by irrigation water were thrown up around the trees in two of the orchards, and the disease has decreased as inspection and eradication have continued. No ascospores have been known to develop in the California area, probably due to the very light summer rainfall. Other environmental factors do not differ greatly from the East. It is believed possible to eliminate the disease by preventing spread through irrigation water or contaminated tools.

Distribution of *Beauveria bassiana* on elm insects in the United States, P. V. MOOK and D. O. WOLFENBARGER. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 1, pp. 76-77).—This adds Pennsylvania and New Hampshire as new locations for *B. bassiana* and gives *Hylurgopinus rufipes*, *Magdalis barbata*, *M. armicollis*, *Saperda tridentata*, and *Tremex columba* as hitherto unreported insect hosts of the fungus from the United States. Of 5,656 insects cultured, *B. bassiana* was isolated from 168.

A disease of the Scots pine (*Pinus sylvestris* L.) caused by the fungus *Diplodia pinea* Kickx associated with the pine spittle-bug (*Aphrophora parallela* Say.).—I, **Symptoms and etiology**, W. R. HADDOX and F. S. NEWMAN (*Roy. Canad. Inst., Trans.*, 24 (1942), pt. 1, pp. 1-18, pl. 1, fig. 1).—Following a review of the literature (32 references) of *D. pinea*, descriptions are given of the fungus and its natural history, and of the symptoms induced by it in Ontario following infestation of the trees by spittle bugs. The fungus was regularly isolated from spontaneous lesions, injection of spores into terminal shoots caused tip blight, and typical crown blight was induced by application of spores to a branch infested with the insect. Observations on the pine spittle bug and its work are recorded.

Experiments on chemical control of damping-off in *Pinus resinosa* Ait., L. P. V. JOHNSON and G. M. LINTON (*Canad. Jour. Res.*, 20 (1942), No. 12, Sect. C, pp. 559-571).—Of a wide range of chemicals tried, Semesan solutions (1:100 to 1:150) applied to the soil consistently gave the best control in both greenhouse and nursery, and red copper oxide suspensions (1:250 to 1:500) were also effective, particularly in the greenhouse. Both the latter and zinc oxide as dusts for seed treatment gave good control in the greenhouse. Combinations of seed and soil treatments were not more effective in the greenhouse than either used separately, and under certain nursery conditions they were less so. As a group, fungicides generally proved more effective than acidifying agents such as H_2SO_4 or $Al_2(SO_4)_3$. The latter appeared to give good control in seasons of normal rainfall, but were more or less ineffective in dry seasons with relatively large amounts of slightly alkaline irrigation water or in wet seasons with excessive percolation. Seedlings from 2-year-old red pine seed of somewhat reduced vitality proved more susceptible than those from 1-year-old seed. White spruce, used in some of the preliminary tests, proved much less susceptible than red pine, though similar in response to the various treatments.

Spread of white-pine blister rust in 1941, L. R. TEHON (*Amer. Nurseryman*, 76 (1942), No. 5, p. 22).

Latest recommendations on control of [Endoconidiophora] canker stain of London plane, P. P. PIRONE (*New Jersey Stas. Nursery Disease Notes*, 15 (1942), No. 6, pp. 21-24).

Susceptibility of wood to decay: Effect of urea and other nitrogen compounds, F. H. KAUFERT and E. A. BEHR. (Univ. Minn.). (*Indus. and Engin. Chem.*, 34 (1942), No. 12, pp. 1510-1515, figs. 2).—The decay rate and susceptibility of southern pine sapwood and Douglas fir, red oak, and cypress heartwoods were not appreciably affected by adding small amounts of urea and ammonium sulfate and phosphate, but higher concentrations of these compounds caused marked reductions in decay. Concentrations approaching those used for chemical seasoning or fireproofing prevented growth of wood-rotting fungi on the test blocks of the woods used. Small concentrations of the organic nitrogen compounds asparagine and peptone increased the decay rate of southern pine sapwood and red oak heartwood, but had little or no effect on that of Douglas fir heartwood, while cypress heartwood showed no signs of decay. These nitrogen compounds thus appear to be more readily utilized by wood-rotting fungi than urea or the ammonia compounds, but the practical significance of the decay increases observed are questioned. Addition of certain soil bacteria to urea-treated wood did not appear to affect its susceptibility to decay by wood-rotting fungi. Heating urea-treated wood to 70°-100° C. for 12-14 hr. caused considerable decomposition and loss of urea, but also appeared to fix some of the urea in the wood so that it was difficult to remove it by leaching. Except for such urea-treated wood, heated as above noted, all the nitrogen compounds were easily leached from wood.

The calorific value and chemical composition of decayed cordwood, M. T. HILBOEN and F. H. STEINMETZ. (Univ. Maine). (*Phytopathology*, 33 (1943), No. 1, pp. 45-50).—As causes of decay in red maple, paper birch, and beech, several white-rot but no brown-rot fungi were known to be present. Although determinations per gram had indicated the loss in calorific value to be slower than the loss in wood substance, showing a change in chemical composition during decay, chemical analysis failed to demonstrate a correlation of reduction in calorific value with the amount of any chemical component. In these analyses the white rots exhibited a depletion of both cellulose and lignin proportional to the loss of wood substance, but no correlation between alkali solubility and loss of any other component. In addition, one characteristic of the brown rots was found, viz, a preferential selection of the pentosans in cellulose. After grinding in a hammer mill, particle size resulting from mechanical screening of the reduced sample was found to influence calorific value, very small particles being higher.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Investigations in economic zoology and entomology by the Montana Station] (*Montana Sta. [Bien.] Rpt.* 1941-42, p. 37).—A progress report (E. S. R., 84, p. 642) by H. B. Mills notes as newly introduced pests the spinose ear tick, screwworm fly, and sweetclover weevil.

[Investigations in economic zoology and entomology] (*Pennsylvania Sta. Bul.* 429 (1942), pp. 11-12, 13, 19-23, 37, figs. 3).—A progress report (E. S. R., 87, p. 546) noting studies by C. A. Thomas, R. D. Casselberry, L. J. Bennett, H. N. Worthley, H. M. Steiner, D. E. H. Frear, and B. D. Gleissner on wireworm control, browse and acorns as emergency foods of deer, wildlife as a valuable Pennsylvania resource, apple spraying, pistol casebearer control, sprays for plum curculio, spray tests, coal tar products for insecticides, ethylene dichloride unsafe on peach trees, control of grape berry moth, and the use of mixed thiocyanate and pyrethrum dusts for mushroom fly control.

[Work with fur-bearing animals in Alaska] (*Alaska Stas. Prog. Rpt.* 1938-41, pp. 36-39, figs. 2).—A progress report is made of (1) a study to determine whether salmon fed as the sole animal protein portion of the ration for Yukon mink is detrimental to the quality of the fur, followed by (2) the results of a feeding experiment with marten as related to finer fur quality and greater prolificacy, (3) a viability investigation of the internal parasite ova of blue foxes under local conditions, and (4) an investigation of ophthalmia in blue fox pups.

[Work with fur-bearing animals by the Oregon Station] (*Oregon Sta. Bul.* 401 (1941), pp. 69-71, fig. 1).—The work of the biennium 1939-40 (E. S. R., 82, p. 353) reported upon relates to the establishment of an experimental fur farm, investigation of fox equipment, fox and mink feeding trials, breeding and reproduction investigations, and fur animal disease problems.

Using fish meal as a partial substitute for raw meat in the year around mink ration, C. F. BASSETT (*Amer. Fur Breeder*, 15 (1942), No. 3, pp. 12, 14, 16-17, 22).

Gestation period in the fisher [*Martes pennanti*], with recommendations for the animal's protection in California, E. R. HALL. (Univ. Calif.). (*Calif. Fish and Game*, 28 (1942), No. 3, pp. 143-147, fig. 1).

Biological control of rodents and predators, V. E. SHELFORD. (Univ. Ill.). (*Sci. Mo.*, 55 (1942), No. 4, pp. 331-341, figs. 3).

Catalogue of birds of the Americas and the adjacent islands in Field Museum of Natural History, C. E. HELLMAYR and B. CONOVER (*Field Mus. Nat.*,

Hist. [Chicago] Pub., Zool. Ser., 13 (1942), pt. 1, No. 1, pp. VI+636).—Number 1 of the first part of this catalog includes birds of the orders Rheiformes, Tinamiformes, Galliformes, Gruiformes, and Columbiformes.

Birds benefit Utah agriculture, G. F. KNOWLTON (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 4, p. 9, fig. 1).—Attention is directed to the importance of birds in checking insect pests in Utah, particularly the grasshopper and beetle leafhopper.

The ducks, geese, and swans of North America: A vade mecum for the naturalist and the sportsman, F. H. KORTRIGHT (*Washington, D. C.: Amer. Wildlife Inst., 1942, pp. VIII+476, pls. 36, figs. [270]*).—Descriptive accounts of the life history of these fowl include their weights and measurements. Colored plates of the forms described, with their winter and autumn plumages, by T. M. Shortt, and a bibliography of nine pages are included.

Cover requirements of the eastern ruffed grouse in northeast Iowa, E. B. POLDERBOER (Iowa Expt. Sta. et al.). (*Iowa Bird Life*, 12 (1942), No. 4, pp. 50-55, fig. 1).—It was found in the study reported that for approximately 45 ruffed grouse on 1,414 forested acres in the vicinity of Lansing, Iowa, from August 1938 to January 31, 1940, the following cover types were of greatest utilization value in the order named: Poplar consociations, 10-20-year-old oak-hickory forest, 5-10-year-old clearings, advanced oak-hickory forest, and 20-35-year-old oak-hickory forest. Cover type groups utilized as loafing cover in order of importance were second growth clearings, advanced forest, and mature forest. Most of the roosts found were on the ground. Winter roosts were chiefly under dogwoods in maple-linden communities on north and east slopes when no snow was on the ground. Following heavy snows the preponderance of winter roosts was found in clearings and in second growth oak-hickory communities.

Ninth and tenth annual reports of the Cooperative Quail Study Association, H. L. STODDARD (*Coop. Quail Study Assoc. Ann. Rpts., 9-10 (1940-41), pp. 39*).—A further report (E. S. R., 84, p. 783) of the progress of work with quail during the calendar years 1940 and 1941.

The white-necked raven in relation to agriculture, S. E. ALDOUS (*U. S. Dept. Int., Fish and Wildlife Serv., Res. Rpt. 5 (1942), pp. II+56, figs. 12*).—The results of a 5-yr. study of the activities and food habits of the white-necked raven (*Corvus cryptoleucus*), during which time field data were gathered and the contents of 827 stomachs were analyzed, are reported. This raven, which is indigenous to southwestern United States and the adjoining sections of Mexico, has gained the same ill repute as acquired by the crow, a close relative, and the magpie. Its omnivorous food habits often bring it into direct competition with farming interests and frequently its depredations result in severe damage to crops, particularly to grain sorghums, corn, melons, peanuts, pecans, weak lambs, and poultry. To reduce these attacks and keep the losses at a minimum often is expensive and requires considerable work and ingenuity on the part of farmers and ranchers. On the other hand nearly half the raven's food is of animal origin and includes a wide assortment of insects, many of which are harmful to crops. Grasshoppers, weevils, May beetles, caterpillars, fly maggots, and like pests constitute a material part of the insect diet. Carrion is another important food of the raven, and its removal from the range is a definite aid to sanitation.

When heavy raven concentrations occur the crops must be protected. As effective control is impossible when natural food is abundant, it is generally necessary to resort to frightening measures until winter sets in and the food supply becomes low enough to insure control success. Various contrivances to scare the birds away may be placed in the fields, but the shotgun is without question the best frightening device. The most successful, selective, and humane control measure

is the use of large cage traps. As the need for control is usually local and varies by seasons, depending upon the crop situation, the soundest policy is to resort to it only when necessary and to take advantage of the bird's better attributes at all other times.

Notes on the nesting habits of the American robin (*Turdus migratorius* L.), J. C. HOWELL (*Amer. Midland Nat.*, 28 (1942), No. 3, pp. 529-603 figs. 5).—This report of a study, based upon field work at Ithaca, N. Y., during a 3-yr. period and a review of the literature, presented with a five-page list of references, includes much data on the feeding and the food of the young.

Handbook of frogs and toads: The frogs and toads of the United States and Canada, A. A. and A. H. WRIGHT (*Ithaca, N. Y.: Comstock Pub. Co., 1942, pp. XI+286, pls. 88, figs. 7*).—This work includes a classified bibliography of 37 pages arranged under the headings of general works, general check lists or catalogs, and State and province lists of the political divisions of North America.

The nematode genus *Skrjabinoptera* Schulz, 1927, B. B. MORGAN. (Univ. Wis.). (*Lloydia*, 5 (1942), No. 4, pp. 314-319, pl. 1).—Present knowledge of the genus *Skrjabinoptera*, including a discussion of those forms which have not been adequately described, a redescription of one species (*S. phrynosoma*), a world host list, and a key to the species, is presented.

[Contributions on economic entomology] (*Ann. Appl. Biol.*, 29 (1942), No. 3, pp. 268-321, figs. 5).—Contributions presented are: Symbiosis and Siricid Woodwasps, by E. A. Parkin (pp. 268-274); Some Notes on the Biology of the Click Beetles *Agriotes obscurus* L. and *A. sputator* L., by H. C. Gough and A. C. Evans (pp. 275-279); Laboratory and Field Experiments on the Control of Wireworms, by H. C. Gough (pp. 280-289); The Quantitative Interaction of Spray Fluid and Active Principle in Determining the Toxicity of a Pyrethrum Preparation to the Argasid Tick *Ornithodoros moubata* Murray, by G. G. Robinson (pp. 290-300); The Use of Toxic Polynitro Derivatives in Pest Control—I, The Estimation of Dinitro-*o*-cresol and Dinitro-*o*-cyclohexylphenol, by R. L. Wain (pp. 301-308); New Methods of Controlling Head and Body Lice, by J. R. Busvine (p. 309); Experimental Work on the Transmission and Development of Scabies, by K. Mellanby (p. 309); Some Quantitative Aspects of Scabies Parasitology, by C. G. Johnson (p. 310); The Control of Flies in Country and Town, by H. G. H. Kearns (pp. 310-313); Furniture Beetles and Other Wood-Borers, by R. C. Fisher (pp. 313-316); and The Invasion of Houses by Earwigs and Ants, by G. F. Wilson (pp. 316-321).

[Contributions on economic insects] (*Assoc. South. Agr. Workers Proc.*, 43 (1942), pp. 127-155).—Abstracts of contributions on economic insects presented at the annual meeting of the Cotton States Branch of the American Association of Economic Entomologists held at Memphis, Tenn., in February 1942 are presented. These relate to the boll weevil, cotton aphid, bollworm, cotton flea hopper, pink bollworm, cotton leafworm, plum curculio on peach, pickleworm, striped blister beetle, sugarcane borer, and stablefly and their control. Other contributions consider methods of rearing *Chelonus* and *Microbracon* parasites; notes on the biology of *Xanthopastis timais* Cramer, a lepidopterous pest of narcissus; and protection of stored grain from insects.

[Entomological investigations by the Georgia Station] (*Georgia Sta. Rpt.* 1942, pp. 77-83, figs. 3).—A progress report (E. S. R., 86, p. 806) noting work with the cowpea curculio (coop. S. C. Expt. Sta.); southern corn rootworm; cotton insects; pale-striped flea beetle; the bill bug *Calendra venata* (Say) and a fly (*Neolasioptera* sp.) on wheat; red-headed caterpillar *Stegasta bosqueella* Chamb. on peanut and partridge pea; a weevil (*Conotrachelus* sp.)

and a mealybug, possibly the grape mealybug, on partridge pea; the lesser corn-stalk borer; and the pepper maggot *Zonosemata electa* (Say).

[Entomological investigations by the Kansas Station]. (Partly coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt. 1941-42*, pp. 48-49, 52-56).—A progress report (E. S. R., 85, p. 84) of work by R. K. Nabours, F. M. Stebbins, R. L. Parker, R. C. Smith, R. H. Painter, H. R. Bryson, D. A. Wilbur, P. G. Lamerson, R. W. Jugenheimer, L. P. Reitz, E. G. Heyne, R. F. Fritz, and K. L. Anderson on studies in inheritance of the grouse locust *Tettigidea parvipennis* Har.; effect of climate on inheritance of the grouse locust; bee investigations; climate and injurious insect investigations; the hessian fly, chinch bug, wheat white grub *Phyllophaga lanceolata* Say, and wireworms (*Monocrepidius vespertinus*) on wheat; the corn earworm, southwestern corn borer, chinch bug, sugarcane root-stock weevil, and southern corn rootworm in sweet corn; fruit and vegetable insects (the red spider mite, juniper midge, redbud leafhoppers, redbud aphid, redbud whitefly, and cankerworms); insects attacking alfalfa, grasses, and allied plants; biology and control of the strawberry leaf roller and the codling moth; and the resistance of crop plants to insect attack.

Montana insect pests, 1941 and 1942, H. B. MILLS (*Montana Sta. Bul. 408* (1942), pp. 36, figs. 9).—This biennial report (E. S. R., 84, p. 785) contains information on grasshopper control during 1941-42 and outlook for 1943; Mormon cricket control; stored grain insects; newly introduced insects, including the screwworm and spinose ear tick *Otiobius megnini* Duges; other records and observations with reference to Say stinkbug, corn leaf aphid, potato and tomato psyllid, red-humped caterpillar, diamondback moth, beet webworm, spruce budworm, army cutworm, pale western cutworm, corn earworm, raspberry root borer, raspberry fruitworm, sweetclover weevil *Sitona cylindricollis*, Fahr., pea weevil, bean weevil, plum gouger, plum curculio, seed-corn maggot, *Wohlfahrtia meigeni* (Schin.) maggots in mink pups, cabbage maggot on turnips, wheat stem sawfly, and the European earwig; and the beekeeping industry in Montana.

[Entomological investigations by the Oregon Station]. (Partly coop. U. S. D. A.). (*Oregon Sta. Bul. 401* (1941), pp. 36-37, 40, 50, 51, 52, 53, 54, 57, 58, 59, 62-63, 65-66, 68, figs. 9).—A progress report of the biennium 1939-40 (E. S. R., 82, p. 355) noting control of prune thrips, control of rust mite on pears, control of the cherry fruitfly, alfalfa weevil, pea aphid control, flax worm, potato flea beetle, onion maggot, symphylids, pea weevil, insect pests of nursery stock, and the filbert worm.

Supplement to Insects of North Carolina, C. S. BRIMLEY (*Raleigh: N. C. Dept. Agr., 1942*, pp. 39).—This supplement to the work noted (E. S. R., 80, p. 367) increases the number of species recorded from the State by 791 and near insects by 52, or a total of 843, bringing the grand total for the State to 11,091 on December 31, 1941.

[Entomological investigations by the Puerto Rico Station]. (Partly coop. U. S. D. A. et al.). (*Puerto Rico Sta. Rpt. 1941*, pp. 19-23).—A progress report (E. S. R., 87, p. 694), by K. A. Bartlett and H. K. Plant, noting liberations of the São Paulo strain of the Amazon fly *Metagonistylum minense* Towns. and shipments to Louisiana and Guadeloupe; receipt of shipments of *Parathresia diatraca* (Bréthes), a fly parasite of the sugarcane borer, and liberations of and shipment to Cuba; establishment of *Coclophora inaequalis* (F.), a coccinellid predator of aphids, and *Pseudaphycus utilis* Timb., a hymenopterous parasite of the coconut mealybug; control of the bamboo scales (*Asterolecanium bambusae* (Bdv.) and *A. miliaris* (Bdv.)) and other scales through use of the introduced coccinellid predators *Egys platycephalus* Muls., *Chilocorus cacti* L., *Pentilia castanea* Muls., *Cladis nitidula* F., and *Curinus* sp.; receipt of

shipment of dipterous parasites (*Ectophasiopsis arcuata* (Bigot) and *Cylindromyia porteri* (Br  thes)) of various species of pentatomids; rearing and liberation of *Dasysepus parvipennis* Gahan, a parasite of the red-banded thrips; the bamboo powder-post beetle *Dinoderus minutus* (F.); control work with the mining scale and hemispherical scale; injury to vanilla plantings by the snail *Subulina octona* Brug and the slug *Veronicalla kraussii* Ferussac; the bean aphid and *Macrosiphum sonchi* (L.) on the orange-glowvine (*Senecio confusus*); and control of the dry-wood or powder-post termite *Kaloterms* (*Cryptoterms*) *brevis* (Walker).

Some applications of insect separation methods to entomology, K. L. HARRIS (*Ent. Soc. Wash. Proc.*, 45 (1943), No. 1, pp. 19-25, fig. 1).

Studies on the hydrogen-ion concentration of insect blood and their bearing on in vitro cytological technique, R. D. BOCHE and J. B. BUCK (*Physiol. Zool.*, 15 (1942), No. 3, pp. 293-303).—Measurements by capillary glass electrode of the H-ion concentration of the larval blood of three species of Diptera give the following average results: *Drosophila melanogaster* pH 7.10, *Sciara coprophila* pH 7.12, and *Chironomus tentans* pH 7.48. Microquinhydrone electrodes, considered somewhat less reliable, give the values pH 7.12 for *Drosophila* and pH 7.38 for *Sciara*. Critics of the methods and the variability of blood H-ion concentration are presented. A table summarizing most of the existing literature on the H-ion concentration of insect blood is included.

Insects of the garden bean in Hawaii, F. G. HOLDAWAY and W. C. LOOK. (Hawaii Expt. Sta.). (*Hawaii. Ent. Soc. Proc.*, 11 (1942), No. 2, pp. 249-260).—The first of a series of articles dealing with insects of crops other than sugarcane and pineapple in Hawaii. The relative importance of the insects has been recorded and the major pests determined. Eight major, 3 submajor, and 23 minor pests and 22 species of beneficial insects are recorded. The major pests have been classified on an ecological basis.

Some insect pests of lilies, E. P. IMLE and A. HARTZELL. (Cornell Univ. et al.). (*Amer. Lily Yearbook*, 1942, pp. 42-47, figs. 4).

Insects infesting house plants.—I, Scale insects, E. I. McDANIEL (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 121-125, figs. 2).—A practical account.

The forests insect situation in eastern Canada in 1941, E. B. WATSON (*Canad. Pulp and Paper Assoc., Woodlands Sect., Ann. Mtg. Proc.*, 24 (1942), p. 42).

Insect pests in stored products, H. HAYHURST (*London: Chapman & Hall*, 1942, 2. ed., pp. XII+108, pls. [55]).—Included in this brief practical account is a list of the substances and their pests (pp. 59-83), list of parasitic and predaceous insects and their hosts (p. 84), a bibliography (pp. 85-105), and a subject index (pp. 106-108).

Rearing fabric pests, F. W. FLETCHER and E. E. KENAGA (*Soap and Sanit. Chem.*, 18 (1942), No. 9, pp. 92-93, 101).—In tests of 10 mixtures composed of varying proportions of fish meal, dog food, corn meal, brewer's yeast, and woolen scraps to determine the most desirable food medium for rearing the black carpet beetle, a culture consisting of 72 percent fish meal, 25 percent corn meal, 3 percent brewer's yeast, and 2 gm. of woolen cloth proved the most satisfactory. Three other food mixtures were acceptable.

Mothproofing tests, F. W. FLETCHER and E. E. KENAGA (*Soap and Sanit. Chem.*, 18 (1942), No. 8, pp. 95-99, fig. 1).—Report is made of cooperative research work aimed at standardization of a procedure for testing fabric insect pest deterrents. A quantitative test employing use of the weight of the frass as a measure of the resistance of fabrics to the pests was used, and the procedure

was later compared with the fabric weight loss method for determining fabric pest resistance. Details of the findings are given in five tables.

Biological control of insects in Canada, A. B. BAIRD (*Amer. Pomol. Soc. Proc.*, 56 (1941), pp. 111-117).

Control of destructive insects by aircraft, W. E. DOVE (*Sci. Mo.*, 55 (1942), No. 4, pp. 382-386, figs. 5).

The war program and the part which insecticides and disinfectants are playing in it, J. E. DUNN, P. A. SURGEON, and L. SCHWARTZ (*Soap and Sanit. Chem.*, 18 (1942), No. 8, pp. 91-94, 105).—Presented with a list of 21 references to the literature.

Some recent advances in insecticides, R. H. MARLOWE. (U. S. D. A.). (*Hawaii. Ent. Soc. Proc.*, 11 (1942), No. 2, pp. 177-194).—This review is presented with a list of 129 references to the literature cited.

Chemistry of insecticides and fungicides, D. E. H. FREAR (*New York: D. Van Nostrand Co.*, 1942, pp. VIII+300, figs. 31).—The subject is dealt with as follows: Stomach poisons or protective insecticides (pp. 5-49), contact poisons or cradicant insecticides (pp. 51-150), fungicides (pp. 151-177), spray supplements and residue removal (pp. 179-205), and analytical methods (pp. 207-277).

Particle size in relation to insecticide efficiency, C. M. SMITH and L. D. GOODHUE. (U. S. D. A.). (*Indus. and Engin. Chem.*, 34 (1942), No. 4, pp. 490-493, figs. 4).

Observations on the automatic distribution of paris green, F. W. KNIPE and P. F. RUSSELL (*Amer. Jour. Trop. Med.*, 22 (1942), No. 4, pp. 447-457, figs. 4).—The automatic distribution of paris green for the control of *Anopheles* breeding along irrigation canal banks is reported upon. Two modifications of the original automatic paris green distributor are described. One is an improved machine for using paris green diluted with dust, such as powdered charcoal. The other is for dustless paris green in a water suspension. The modified machine for distribution of dust was given thorough field trials and performed satisfactorily, with effective larva control. The other machine had fewer trials but seemed to function well.

Preparation of pure geraniol, H. A. JONES and J. W. WOOD. (U. S. D. A.). (*Indus. and Engin. Chem.*, 34 (1942), No. 4, p. 488).

Needed: A substitute for pyrethrum, C. A. DOEHLERT. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc. Proc. Ann. Conv.*, 73 (1942), pp. 19-23).—The need of a substitute for pyrethrum led to tests which have shown the synthetic compound Lethane to have a definite lethal effect on the adult bluntnosed leafhopper *Ophiola striatula* Fall. While the percentage of kill by Lethane was not as high as with pyrethrum it may prove to be sufficiently toxic to control the nymphs. There appeared to be a progressive resistance of adult leafhoppers from July 14 to August 12. Mixing 9 parts of talc to 1 of pyrethrum and using it at a rate corresponding to 75 lb. per acre produced very good kills. Lethane did not increase the effectiveness of pyrethrum to any notable extent. DN dust (a dinitro-o-cyclohexylphenol dust) may be as effective as Lethane.

Increased toxicity with rotenone dusts, E. J. CAMPAU, H. F. WILSON, and R. L. JANES (*Soap and Sanit. Chem.*, 18 (1942), No. 8, pp. 100-101, 103).—The percentage of control obtained in 24 hr. in tests made of a series of chemicals, compared to determine their possible value as adjuvants in rotenone dusts (with and without SAE10 lubricating oil) in which 0.1 percent rotenone was used, is compared with the results of similar experiments with rotenone dusts (with and without the oil) in which 0.05 percent rotenone was employed. The results indicate that under these conditions consistent increased control with low concentrations of rotenone is obtained.

Reclamation with rotenone of Crystal Lake, Los Angeles County, California. E. H. VESTAL (*Calif. Fish and Game*, 28 (1942), No. 3, pp. 136-142, figs. 4).—The successful reclamation with rotenone from pest fish (chub)-infested Crystal Lake in the Angeles National Forest, Los Angeles County, is reported upon.

Tephrosia extract against house flies. H. A. JONES and W. N. SULLIVAN (U. S. D. A.). (*Soap and Sanit. Chem.*, 18 (1942), No. 9, pp. 94-95).—The tests reported have shown that the domestic plant *T. virginiana* may be successfully substituted for derris and cube roots in fly sprays. The work also indicates that no added solvent is necessary to obtain kerosene extracts of rotenone-bearing roots with a high degree of toxicity to houseflies. The insecticidal importance of constituents other than rotenone is again emphasized.

Preventing damage to buildings by subterranean termites and their control (U. S. Dept. Agr., *Farmers' Bul.* 1911 (1942), pp. [2]+37, figs. 31).—A practical account which supersedes Farmers' Bulletin 1472 (E. S. R., 55, p. 152) and Leaflet 101 (E. S. R., 70, p. 209).

Studies of North American Plecoptera, with special reference to the fauna of Illinois. T. H. FRISON (*Ill. Nat. Hist. Survey Bul.*, 22 (1942), Art. 2, pp. [4]+235-355, figs. 127).—A report of studies in which 85 forms are recognized, 23 being described as new to science.

A study of riboflavin metabolism in the American [cock]roach by fluorescence microscopy. R. L. METCALF and R. L. PATTON. (Cornell Univ.). (*Jour. Cell. and Compar. Physiol.*, 19 (1942), No. 3, pp. 373-376).

Forecasts of incipient outbreaks of the brown locust [*Locustana pardalina* (Walk.)], C. J. B. SMIT (*Jour. Ent. Soc. South. Africa*, 4 (1941), pp. 206-221).

The acarine parasites of South African acridids, with special reference to the genus *Podapolipus*. M. LAVOPIERRE (*Jour. Ent. Soc. South. Africa*, 4 (1941), pp. 71-80, figs. 5).—A summary of the knowledge of acarine parasites infesting locusts in South Africa.

The potato leafhopper, a pest of alfalfa in the Eastern States. F. W. POOS (U. S. Dept. Agr. Leaflet 229 (1942), pp. 8, figs. 3).—A practical account.

A taxonomic revision of the genus *Eutettix* in America north of Mexico (Homoptera: Cicadellidae). L. W. HEPNER (*Kans. Univ. Sci. Bul.*, 28 (1942), No. 2, pp. 253-294, pls. 3).—Thirty forms of leafhoppers of the important genus *Eutettix* are considered, of which 18 are described as new to science.

The food and feeding habits of *Antestia* in Kenya. R. H. LE PELLEY (*Bul. Ent. Res.*, 33 (1942), No. 2, pp. 71-89, pls. 2, fig. 1).—Report is made of studies of *A. lincaticollis* in Kenya, where, in addition to *Coffea arabica*, *Psychotria nairobiensis* and *Pavetta eliottii* are known as host plants.

Avoid residue in tomato psyllid treatment. G. M. LIST. (Colo. Expt. Sta.). (*Canning Age*, 23 (1942), No. 8, p. 431).

A simple method for use in staining living aphids. R. P. GORHAM (*Canad. Ent.*, 74 (1942), No. 12, p. 236).

Systema Aphididae: A guide to the phylogeny of the aphids or plant lice.—I, The Lachnea, O. W. OESTLUND (*Rock Island, Ill.: Augustana Book Concern*, [1942], pp. V+78).

Some experiments on the sugarcane mealybug *Trionymus* (*Pseudococcus*) *sacchari* Ckll., J. DICK (*So. African Sugar Technol. Assoc., Ann. Cong. Proc.*, 16 (1942), pp. 55-56, fig. 1).—A brief report of preliminary experiments that emphasize the danger of planting sugarcane sets infested by mealybugs due to the harmful effect on germination and subsequent growth.

Life-history and bionomics of *Pseudococcus saccharicola* Takh. (Homopocccidae), a new pest of sugarcane in India. S. RAM MOHAN RAO (*Indian*

Acad. Sci. Proc., 16 (1942), No. 3, Sect. B, pp. 79-85).—Included in this account of a new pest of sugarcane in India are notes on its predators and parasites.

Fumigation in red scale control, D. L. LINDGREN. (Calif. Citrus Expt Sta.). (*Calif. Citrog.*, 27 (1942), No. 11, pp. 308-309, 324).

Systematics of the meloid genera *Hornia* and *Allendesalazaria* (Coleoptera), E. G. LINSLEY (*Calif. Univ. Pubs. Ent.*, 7 (1942), No. 8, pp. 169-187, pls. 2, figs. 2).

Recent progress in wireworm control, J. A. MUNRO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 2, pp. 7-11, figs. 3).—A progress report, with special reference to the prairie grain wireworm *Ludius acreipennis destructor* Brown, which notes the general life cycle of this pest as well as recommendations for control, with particular emphasis on clean summer fallow, rotations, proper varieties for least injury, time of planting, and selection of most suitable fields.

The grape rootworm, D. ISELY (*Arkansas Sta. Bul.* 426 (1942), pp. 26, figs. 5).—This insect is the most destructive pest of grapes in Arkansas. Adults feed on foliage and green berries. Larvae feed on sapwood of larger roots and destroy small roots. Vine vigor is reduced because of girdling. Eggs are deposited from June to August in flattened clusters on the canes under bark strips, and upon hatching the larvae drop and burrow into the soil. Some become fully grown before winter, which is passed by these larvae at depths of a few inches to nearly 2 ft. The majority renew feeding in the spring, apparently requiring a second year for development. Pupation takes place largely in May, and adults begin to emerge from the soil shortly thereafter. Adults may be destroyed during the preoviposition period of about 2 weeks with one or two grape foliage sprays of 1.5 lb. of derris powder (containing 4 percent of rotenone) in 50 gal. of water. An application of 1.5 lb. of lead arsenate in 50 gal. of water or in bordeaux mixture, which is usually made to control other vineyard pests, is effective for the control of light infestations.

Progress in pine beetle control through tree selection, F. P. KEEN and K. A. SALMAN. (U. S. D. A.). (*Jour. Forestry*, 40 (1942), No. 11, pp. 854-858).—The method of western pine beetle control through removal of high risk trees from the stand is considered. A description is given of the various tree classifications that have been proposed and their application to bark beetle control.

The biology and natural control of the larch-shoot moth *Argyresthia laevigatella* H.-S., B. P. BEIRNE (*Roy. Dublin Soc., Econ. Proc.*, 3 (1942), No. 11, pp. 130-149, figs. 28).—Report is made of an investigation of the biology and natural control in Ireland of *A. laevigatella*, which causes a considerable amount of damage annually throughout Europe and the British Isles. Insectivorous birds are said to be the most important factor in natural control in Ireland, destroying an average of 67 percent of the larvae and pupae. A further 10 percent are destroyed by fungi, nematodes, hymenopterous parasites, and other factors. *Ephialtes* (*Pimpla*) *elegans* Woldst., the only hymenopterous parasite reared on the larva of this parasite, averaged a destruction of 1 percent. A general account of the systematics, synonymy, distribution, life history, and biology of *E. elegans* is given, with descriptions of the morphology of the early stages. A list of 21 references to the literature is included.

Owlet moths (Phalaenidae) taken at light traps in Kansas and Nebraska, H. H. WALKDEN and D. B. WHELAN. (Coop. Nebr. Expt. Sta.). (*U. S. Dept. Agr. Cir.* 643 (1942), pp. 26, figs. 11).—Approximately 90 percent of the owlet moths taken in light traps in six localities during the period 1934-37 were of economic importance. Sex ratio varied greatly with the species. Although the numbers of moths taken differed greatly in the separate localities, from year to year and time of year when the greatest period of flight occurred, the flights of indi-

vidual species showed the same trend in all localities. Species with a single generation per year had a short flight period, usually from late August to early October. Flights of different generations of multiple-generation species were not clearly defined.

Biología de la Laspeyresia molesta en el Uruguay [Biology of the oriental fruit moth in Uruguay], R. J. AMABILE ARANDA (*Univ. Repub. [Montevideo], Rev. Facult. Agron., No. 27 (1942), pp. 137-166, figs. 30*).

The calyx spray in codling moth control, D. B. WADDELL and J. MARSHALL (*Sci. Agr., 22 (1942), No. 7, pp. 413-418*).—In laboratory investigations in British Columbia the "first instar codling moth larvae, when penetrating the calyx cavity a month or more subsequent to petal fall, chewed very little on the inner parts of the calyx but did so fairly extensively on the sepals. A calyx spray of lead arsenate applied by a spray gun when 90 percent of the petals had fallen was found to be fairly effective in preventing the entry of codling moth larvae at the calyx a month later. Three mo. after application the calyx treatment still showed distinct value. An angle nozzle on a bamboo rod, used from spray tank as well as ground, deposited no more spray on the calyx parts than a single nozzle spray gun used from the ground alone, although the operation required three times as long." The functions of the calyx spray as now applied in that province appear to be to deposit poison on the inner surfaces of the sepals, to insure protection before the earliest first generation larvae are hatched, and to act as a basis for later sprays and so contribute to a maximum deposit when attack of first generation larvae becomes general. Application of the calyx spray for codling moth control in that province appears to be sound practice, though there seems no reason to believe that in applying that spray it is essential to force spray material into the inner calyx cavity.

Varietal interplanting in relation to control of the codling moth, R. I. NEL (*Jour. Ent. Soc. South. Africa, 4 (1941), pp. 111-134, figs. 9*).—A study was made of the trends of production of codling moth larvae in pear varieties in two orchards of different varietal composition by the banding method, considered to be more accurate for this purpose than the "exit-hole" method. The time that first-brood larvae attained maturity varied according to variety, there having been differences of from 2 to 3 weeks with respect to the periods of peak larval production between the varieties Clapp Favorite and Beurre Hardy and of lesser periods among other varieties. The succession in time of larval production appears to follow the order of blossoming, and there is apparently a close relation between blossoming and egg laying. Differences were recorded between varieties as regards the total extent of larval contribution and the relative production of first- and of summer-brood larvae. The main factors that influence varietal infestation and larval production in orchards, i. e., the seasonal level of codling moth activity, the time and period of availability of fruit, varietal attractiveness for egg laying, and varietal resistance to infestation, are discussed. The influence of various varietal types on population build-up through the season and on the carry-over of the pest from one season to the other is analyzed. A list of 26 references to the literature is included.

Ear worm control in sweet corn, C. T. SCHMIDT. (*Univ. Hawaii*). (*Hawaii. Ent. Soc. Proc., 11 (1942), No. 2, pp. 195-197, fig. 1*).—In experimental work the use of white mineral oils either alone or with the addition of rotenone in the form of derris extract gave a satisfactory control of the corn earworm when applied to the wilted silks with a mechanic's oiler. Damage to the extent of 10.6 percent occurred where oil alone was used and 6.2 percent where derris extract was added, as compared to 60.8 percent in the untreated checks.

A tachinid parasitic on *Plutella maculipennis* Curt., F. I. VAN EMDEN (*Bul. Ent. Res.*, 33 (1942), No. 4, pp. 223-225, fig. 1).—A tachinid reared from the diamondback moth in Nairobi is described as new under the name *Cadurcia plutellae*.

Host plants and parasites of some lepidopterous larvae, W. L. PUTMAN (*Canad. Ent.*, 74 (1942), No. 12, pp. 219-224).—These data supplement the earlier contribution (E. S. R., 73, p. 655).

Notes on some lepidopterous pests on fruit trees, and their parasites, in Ireland during 1941, B. P. BEIRNE (*Roy. Dublin Soc., Econ. Proc.*, 3 (1942), No. 9, pp. 107-118, figs. 9).

Lepidopterous pests of maize in Trinidad, H. B. N. HYNES (*Trop. Agr. [Trinidad]*, 19 (1942), No. 10, pp. 194-202, figs. 2).

Biology and control of mosquitoes in the rice area, W. R. HOESFALL (*Arkansas Sta. Bul.* 427 (1942), pp. 46, figs. 4).—Two flood-water and two permanent-water species of noxious mosquitoes constituted from 98 to 99 percent of the population on Grand Prairie in Arkansas County. *Psorophora confinnis* (L.-A.) and *P. discolor* (Coq.) of the former group make up from 83 to 94 percent of the light-trap collections, while the common malaria mosquito and *Culex erraticus* D. and K. account for the remainder. *P. confinnis* occurs from mid-May until early September, with one peak appearing the latter half of June and the other in late July and throughout August. Growing soybeans or leaving the land idle the season before rice is an effective means for reducing numbers of this species. Applying a miscible oil at the rate of 4 p. p. m. is a means of direct chemical control. The common malaria mosquito is most active from early June until late September. During two of three seasons larvae were most numerous in rice fields from mid-June until mid-July. *Anopheles* larvae occurred most abundantly in open water in rice fields. Isolation, drainage, oiling, and treatment with paris green, as well as the use of top-water minnows of the genus *Gambusia*, are useful control measures.

The mosquitoes of Oklahoma, L. E. ROZEBOOM (*Oklahoma Sta. Tech. Bul.* 16 (1942), pp. 56, figs. 81).—Of the 40 species reported, 13 belong to the genus *Aedes*, 5 to *Anopheles*, 7 to *Culex*, 9 to *Psorophora*, 2 to *Theobaldia*, and 1 each to *Mansonia*, *Megarhinus*, *Orthopodomyia*, and *Uranotaenia*. Breeding places, seasonal and relative abundance, and larval associations of Oklahoma mosquitoes are discussed. Keys are included for use in the determination of females, males, and larvae, and supplemented by 78 photomicrographs. Notes on each species mention recognition characters, distribution, and habits. Mosquito control is briefly discussed and a selected list of references included.

The anopheline mosquitoes of the Caribbean region, W. H. W. KOMP (*U. S. Pub. Health Serv., Natl. Inst. Health Bul.* 179 (1942), pp. IX+195, figs. 155).—A summary of the present knowledge of the anopheline mosquitoes of the Caribbean region based upon examination of the literature and personal observations by the author. It deals with their known geographic distribution and status as vectors of malaria but more particularly with their classification and identification. The account is written primarily from the point of view of the systematic entomologist, but the needs of the field man engaged in malaria control have been kept in mind. For this reason there have been incorporated numerous illustrations and keys, the latter in both Spanish and English, together with a list of entomological terms in English, Spanish, and Portuguese for the convenience of Latin-American workers. Included are brief notes on habitat, distribution, and relative commonness of the species, of which 22 are recognized.

Synoptic tables for the identification of the full-grown larvae of the Indian anopheline mosquitoes, I. M. PURI ([India] *Health Bul.* 16 (*Malaria Bur. No.* 7), 4. ed. (1941), pp. [9]+109, figs. 84).

Notes on improvements made to equipment for spray-killing of adult mosquitoes, F. W. KNIPE and N. R. SITAPATHY (*Amer. Jour. Trop. Med.*, 22 (1942), No. 4, pp. 429-446, figs. 10).—A description is given of improvements in six types of equipment for use in malaria control by spray-killing adult mosquitoes in rural areas.

The utilisation of waste lubricating oil in mosquito larvicides, W. A. L. DAVID (*Bul. Ent. Res.*, 33 (1942), No. 4, pp. 235-240).—Examination was made of nine samples of waste oils, the suitability of which as larvicides was determined after blending with kerosene and diesel oil. It was concluded that blends containing 25-30 percent of waste oil are not so effective as an approved commercial larvicide at the same dosage, but that with a higher dosage, which is still within the range commonly applied in the field, i. e., between 4 fluid oz. and 6.7 oz. per 100 sq. ft., they give good results. The higher dosage is only necessary when culicine larvae have to be controlled. Other blends containing 10-20 percent of waste oil are as effective as an approved commercial sample.

[Contributions on anopheline mosquitoes and their control] (*Jour. Natl. Malaria Soc.*, 1 (1942), pp. 5-24 45-55, 69-124, 149-162, figs. 47).—Among the contributions presented are the following: Species Eradication—A Practical Goal of Species Reduction in the Control of Mosquito-Borne Disease, by F. L. Soper and D. B. Wilson (pp. 5-24); The Crushing Strength of Biological Films on Natural Waters and the Spread of Larvicidal Oils, by C. E. Renn (pp. 45-55); Circular Joint and Concrete Form Design for Precast Inverts for Malaria-Control Ditch-Lining, by W. A. Legwen and L. G. Lenert (pp. 69-82); The Design and Application of a New Type Automatic Siphon for Malaria Control, by W. A. Legwen and R. S. Howard, Jr. (pp. 83-92); Studies on Artificial Resting Places of *Anopheles quadrimaculatus* Say, by M. H. Goodwin, Jr. (pp. 93-99); Studies on the Choice of a Medium for Oviposition by *Anopheles quadrimaculatus* Say, by H. O. Lund (pp. 101-111); Review of Recent Publications on the Prophylaxis and Treatment of Malaria, by H. C. Clark (pp. 113-124); A Review of Recent Work in Avian Malaria, by M. D. Young (pp. 149-156); and Entomological Work During 1941 Bearing on the Malaria Problem, by S. J. Carpenter, T. T. Brackin, Jr., and D. F. Ashton (pp. 157-162).

Manual for the microscopical diagnosis of malaria in man, A. WILCOX (*U. S. Pub. Health Serv., Natl. Inst. Health Bul.* 180 (1942), pp. IX+39, pls. 13).

Madiza: A chloropid or a milichiid (Dipt.)? (C. W. SABROSKY. (Mich. Expt. Sta.). (*Ent. Mo. Mag.*, 4. ser., 3 (1942), No. 32, pp. 169-171).—The proper classification of some flies common to both Europe and North America is reviewed.

The activity of the Mediterranean fruitfly at cold temperatures, with reference to its status during the citrus season in Palestine, E. RIVNAY (*Jour. Ent. Soc. South. Africa*, 4 (1941), pp. 166-176, figs. 5).—Laboratory observations indicate that at a temperature of 10°-13° C. most of the Mediterranean fruitflies do not move about, that lively activity does not take place at a temperature below 16°, and that this fruitfly does not oviposit at a temperature below 16° and at a relative humidity above 85 percent. Breeding of flies in cages hung on trees and observations of their activity indicate that no oviposition takes place on rainy days or when the average daily temperature is below 16°. Records taken in the grove on oviposition show no oviposition of any importance in the latter part of November 1940, and that stung oranges may be infested again and again throughout the period of oviposition in oranges.

Effect of temperature on recovery of houseflies, C. EAGLESON. (U. S. D. A.). (*Soap and Sanit. Chem.*, 18 (1942), No. 6, pp. 115-117, 141, figs. 4).—The failure, in ordinary use, of pyrethrins and Lethane (beta-butoxy-beta'-thiocyanodethylether) to kill all of the houseflies that are stupefied led to the investigation of the effect of temperature on recovery from the effects of these toxicants. Equations and graphs are presented which show the recovery from applications of pyrethrins and from Lethane administered at temperatures ranging from 22° to 38° C. Temperature was shown to exert less influence on the recovery of houseflies sprayed with Lethane than on that of flies sprayed with pyrethrins. It is concluded from the recovery curves that these toxicants are like narcotics in their action and in order to insure death must be administered in doses considerably stronger than necessary to produce complete torpor.

The common housefly (*Musca domestica*) as a source of pollution in food establishments, M. OSTROLEK and H. WELCH (*Food Res.*, 7 (1942), No. 3, pp. 192-200, figs. 3).—In the studies reported, presented with a list of 23 references to the literature, washings from the surface of flies contained from 2,500,000 to 29,500,000 bacteria per fly. Colon-aerogenes bacteria are present in amounts representing 84,000 to 2,000,000 bacteria, *Escherichia coli* being present in considerably reduced numbers. The incidence of colon-aerogenes bacteria externally and internally was found to depend largely upon the material on which the flies are fed. The methods employed in rearing and examining flies in the laboratory are described.

The parasitic habits of *Muscina stabulans* Fabricius, C. H. CURRAN (*Jour. N. Y. Ent. Soc.*, 50 (1942), No. 4, pp. 335-336).—The data presented indicate that the false stablefly may be predaceous and yet at times parasitic on other insects.

New species of *Anastrepha* and notes on other (Diptera: Tephritidae), A. STONE. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 32 (1942), No. 10, pp. 298-304, figs. 14).—This contribution, supplementing the author's revision of the genus *Anastrepha* previously noted (E. S. R., 36, p. 661), presents descriptions of seven additional species and additional information on others.

The fleas of North America: Classification, identification, and geographic distribution of these injurious and disease-spreading insects, H. E. EWING and I. FOX (*U. S. Dept. Agr., Misc. Pub. 500* (1943), pp. 143, figs. 13).—A revision of the North American genera and of the higher categories of the world is given, including keys and formal descriptions. For species, subspecies, and varieties formal descriptions have usually been supplanted by informal remarks on identification characters, but in all cases the following data have been given: Indication of synonymy, scientific and common name of type host, type locality, and a statement relative to range. Usually also further information has been added relating to the nature of the original description, references to figures, published or new notes on biology, economic importance, and redescriptions. Following the introduction there is a short discussion of the economic importance of fleas and a consideration of the external morphology of the group and its origin and phylogenetic relationships. The taxonomic part proper is followed by a list of synonyms of the North American species and subspecies, a bibliography of 91 references, and a taxonomic index. In this paper 61 genera, 14 subgenera, 209 species, and 63 subspecies and varieties of fleas are listed from North America and the West Indies.

***Nosema apis* in package bees**, J. F. REINHART (*Amer. Bee Jour.*, 82 (1942), No. 12, p. 516)

Nosema disease contributes to winter losses and queen supersedure, C. L. FARRAR. (U. S. D. A. coop. Univ. Wis.). (*Gleanings Bee Cult.*, 70 (1942), No. 11, pp. 660-661, 701).

The ants of Utah, A. C. COLE, JR. (Univ. Tenn.). (*Amer. Midland Nat.*, 28 (1942), No. 2, pp. 358-388, figs. 5).

Red scale parasites: Comparison of oriental races of *Comperiella bifasciata* in California, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 28 (1943), No. 3, p. 78).

Glyptometopa Ashmead and related genera in the Brachycistidinae, with descriptions of new genera and species (Hymenoptera: Tiphidae), C. E. MICKEL and K. V. KROMBEIN. (Minn. Expt. Sta.). (*Amer. Midland Nat.*, 28 (1942), No. 3, pp. 648-679, figs. 21).—Seven genera are erected and 12 species described as new to science.

Preliminary notes on the natural control of the European spruce sawfly by small mammals, R. F. MORRIS (*Canad. Ent.*, 74 (1942), No. 11, pp. 197-202).—Attention is called to the importance of small mammals as factors in the natural control of destructive forest insect pests. "In eastern Canada it is common to find as high as 40- to 50-percent control of the European spruce sawfly effected under epidemic conditions by small forest mammals. The cinereous shrew, the red-backed vole, and the white-footed mouse are the most abundant mammals in the coniferous forests of this region, the cinereous shrew being the most effective in sawfly control. Population studies show that there is a considerable seasonal fluctuation in the population of small mammals. The character of the site has an important influence on the population of shrews and rodents, dry sites with abundant protective ground cover being preferred. Little insect control by mammals can be expected in stands which have suffered the burning of brush or other 'clean-up' procedures. The activity of small mammals in searching for sawfly cocoons is greatest in the fall, when the mammal population is high and the hoarding of cocoons is a common practice. The searching ability of small mammals is remarkably high. The shrews, but not the rodents, have the ability of recognizing sound cocoons before they open them."

Sawfly infestations in Pennsylvania, H. C. WILL (*Pa. Acad. Sci. Proc.*, 16 (1942), pp. 47-51, figs. 4).—The sawfly infestations noted in this contribution include *Arge macleayi* (Leach) on the hazelnut at Bedford, Pa., the azalea sawfly *Amauronematus azaleae* Marlatt in a greenhouse at Collingdale, and the red-headed pine sawfly on seedling pines used for reforestation purposes.

The brown dog tick, an important house pest, known scientifically as *Rhipicephalus sanguineus* (Latr.), F. C. BISHOPP. (U. S. D. A.). (*Pests*, 10 (1942), No. 9, pp. 6-8, figs. 8).

***Ixodes bacrgi*, a new species of tick from Arkansas (Acarina: Ixodidae)**, R. A. COOLEY and G. M. KOHLS (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 49, pp. 1869-1872, figs. 3).—A tick, apparently parasitic on the cliff swallow, is described as new under the name *I. bacrgi*.

Notes on the seasonal history of the rabbit tick (*Haemaphysalis leporis-palustris*) in Oklahoma, G. W. EDDY. (Okla. A. and M. Col.). (*Ent. Soc. Wash. Proc.*, 44 (1942), No. 7, pp. 145-149, fig. 1).

Ornithodoros ticks as a medium for the transportation of disease agents, R. R. PARKER (*Pub. Health Rpts. [U. S.]*, 57 (1942), No. 52, pp. 1963-1966).

The relative toxicity of rotenone and pyrethrum in oil to the argasid tick *Ornithodoros moubata* Murray G. G. ROBINSON (*Bul. Ent. Res.*, 33 (1942), No. 4, pp. 273-281, figs. 3).—Coal tar phenols were found to be useful intermediate solvents for making solutions of rotenone in both mineral and vegetable oils.

Medium petroleum oil showed superiority to peanut oil as a carrier of rotenone in xyleneol tested against *O. moubata*. The solutions of rotenone in xyleneol and oil showed no deterioration after storage in the dark at room temperature for 6 weeks. In these solutions rotenone proved far less toxic to *O. moubata* than an equal weight of pyrethrin I in medium petroleum oil.

The tropical chigoe in California, G. F. AUGUSTON (*Science*, 96 (1942), No. 2504, p. 581).—The chigoe, a tropical and subtropical siphonapterous pest also commonly known as chigger, jigger, or sand flea, is reported as found infesting a Pacific horned owl (*Bubo virginianus pacificus*) at Oceanside, San Diego County. This is said to be the first record of the collection of the adult in the continental United States aside from a single case at New Orleans, La.

Experiments on the survival and behaviour of the itch mite *Sarcoptes scabiei* DeG. var. *hominis*, K. MELLANBY, C. G. JOHNSON, W. C. BARTLEY, and P. BROWN (*Bul. Ent. Res.*, 33 (1942), No. 4, pp. 267-271).—In this work, the details of which are given in tables, adult female *Sarcoptes* were killed by 120° F. in 10 min. and by 117.5° in 30 min. At 82° no *Sarcoptes* survived for 2 days, and the majority died in 24 hr. At 55° and 90 percent relative humidity the majority of the mites died within a week, but a few survived longer, even up to 14 days. At temperatures below 55° the mites survived for a shorter time. *Sarcoptes* gives no reactions, positive or negative, to unidirectional light. Below 59° *Sarcoptes* is in chill coma. Little movement occurs below 68°. In temperature gradient mites seldom, if ever, go below 75°. They will walk into high temperatures which prove rapidly lethal.

Some notes on the taxonomy of grain mites (Acarina: Acaridae, formerly Tyroglyphidae), H. E. EWING and H. H. S. NESBITT (*Biol. Soc. Wash. Proc.*, 55 (1942), pp. 121-124).

ANIMAL PRODUCTION

[Experiments in livestock production by the Bureau of Animal Industry.] (Partly coop. expt. stas. et al.) (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1942, pp. 7-8, 9-10, 11-12, 13-15, 15-16, 17-18).—In continuation of previous investigations (E. S. R., 86, p. 662), progress is briefly reported on investigations of quality of beef produced on cottonseed meal and hulls; the influence of the ratios of concentrates to lespedeza hay on beef finish and quality; relation of curing temperature and pumping to salt absorption and spoilage by ham; storage temperature and tenderness of lamb; relation of separable fat from lamb carcasses to grade; heat disposal and tolerance in cattle; mineral deficiencies in cattle; vitamin A deficiencies in fattening cattle; relation of yellow corn storage to vitamin A deficiency; sweetpotato pulp for steers; creep feeding calves on reed pasture; grazing and dry-lot feeding beef cattle on grass, centipede grass, and crested wheatgrass hay; nutritive value and digestibility of grasses for sheep; blood phosphorus of range sheep; management and burning ranges; permanent marking and tattooing of sheep; methods for grinding feathers; relation of staple length to wool yield; shrinkage of wool in different breeds; ground soybean hay for swine; proteins in swine rations; deficiencies in the vitamin B complex, including pyridoxin and pantothenic acid for swine; the control of necrotic enteritis; rations for horses; the preservation of eggs by drying and oiling shells; the vitamin D requirement of turkey poults; effect of color of light on the well-being of chicks; relation of oils in the ration to egg production; and the relation of phosphorus, para-aminobenzoic acid, choline, and pantothenic acid to normal keel development.

[Livestock experiments by the Alaska Stations] (*Alaska Stas. Prog. Rpt.* 1938-41, pp. 7-8, 11-13, 17-21, figs. 2).—Results are briefly reported on projects

dealing with oat and pea silage as a substitute for dry cured hay for dairy cows, oat and pea pasture with and without grain for swine, pork curing and storage, raising dairy calves on a minimum of milk, and rations for wintering sheep.

[**Livestock feeding and grazing investigations by the Georgia Station**] (*Georgia Sta. Rpt. 1942*, pp. 45-49, 51, 57-62, 76, 102).—Brief results are reported on a comparison of peanut, soybean, sericea, kudzu, and lespedeza hays for fattening beef cattle; studies of corn and peanuts on the vine and peanut hay for fattening beef cattle; supplements to pasture in comparison with no supplements for beef heifers; wintering beef cattle with silage and peanut hay, with and without supplements, and corn and bagasse silages for wintering beef cattle; creep feeding beef calves on pasture; sweetpotatoes and vine storage in pit silos; the feeding value of potato meal for sheep; peanuts as a feed for hogs; temporary winter pastures for grazing cattle; grazing cattle on improved v. unimproved pastures; and the needs of potassium in swine feeding.

[**Studies in livestock production by the Kansas Station**] (*Kansas Sta. Bien. Rpt. 1941-42*, pp. 35-39, 39-40, 44-45, 47-48).—Brief results are presented on the calcium requirements of swine, by C. E. Aubel, J. S. Hughes, and L. M. Roderick; soybean meal as a feed for lambs, by R. F. Cox; the mineral requirements of fattening cattle, continuing studies of fattening calves (E. S. R., 85, p. 94), and sorghum roughages and grains in the cattle-fattening ration, both by A. D. Weber and Hughes; dark cutters in beef and seasoning in pork sausage, by D. L. Mackintosh, J. L. Hall, and G. E. Vail; grass silage, modified rations, and artificial insemination for poultry and broiler production, and rations and breeding for turkey production, both by L. F. Payne, D. C. Warren, and A. E. Schumacher; egg yolk color and the role of pigments in poultry nutrition, by Payne, Schumacher, W. J. Peterson, and Hughes; and the nutritive value of dried eggs, shell treatment, and storage changes in poultry fat, by R. M. Conrad, Payne, Schumacher, and Vail.

[**Animal husbandry studies in Montana.**] (Partly coop. U. S. D. A.). (*Montana Sta. [Bien.] Rpt. 1941-42*, pp. 16-18, 46, 53, 57-60).—Results are reported by R. T. Clark which deal with feeding and performance tests with beef cattle, wool shrinkage, sheep breeding, range methods for sheep, and home-grown grains for feeding lambs; by D. Hansen on grain supplements for lambs; by R. M. Williams on feeding trials with crested wheatgrass for steers; and by F. S. Willson and J. R. Quesenberry on breeding and feeding trials with beef cattle.

[**Livestock investigations by the Oregon Station**] (*Oregon Sta. Bul. 401 (1941)*, pp. 19-20, 25-29, 33-34, figs. 4).—Results of projects on the following subjects are briefly reported: Keeping laying hens in batteries; value of green feeds for laying hens; comparison of pea vine silage, alfalfa hay, and wild hay for wintering beef cows; various rations for fattening baby bees; wintering range ewes on grain hay and alfalfa hay, with and without molasses and wheat; palatability of pasture grasses and legumes for sheep; feeding value of cull dried pears for hogs; the effect of wheat and corn in the melting point of lard; proximity of water on Squaw Butte range for cattle; and grazing logged-off land with cattle and sheep.

[**Investigations in animal production by the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 429 (1942)*, pp. 14-15, 26-29).—Brief results of studies by P. T. Ziegler, F. L. Bentley, T. B. Keith, M. A. McCarty, and R. C. Miller are given on the use of alfalfa-molasses silage for steers; soybean meal for pigs on rape pasture; soybean meal, dehydrated alfalfa meal, vacuum-dried liver, brewers' yeast, and carotene as valuable supplements to corn and tankage for pigs; and wheat bran, corn, and soybeans in the nutrition of lambs.

R. R. MURPHY, P. MARGOLF, R. V. BOUCHER, H. PATRICK, and W. T. S. THORP report on plant protein feeds for poultry rations, lights in turkey production, riboflavin and turkey egg hatchability, separate incubators for hatching turkey poults, and range v. cut green feeds for turkeys.

The utilization of urea by ruminants as influenced by the presence of starch in the ration, R. C. MILLS, A. N. BOOTH, G. BOHSTEDT, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 925-929, fig. 1).—Continuing study of factors influencing the utilization of urea by ruminants (E. S. R., 86, p. 375), it was found that when urea was fed to a heifer with timothy hay, hydrolysis to ammonia was delayed in the rumen and the protein level was slightly lower than on timothy hay alone. Microbiological activity was great when starch was fed in addition to timothy hay and urea. It was completely hydrolyzed in 1 hr., and the ammonia disappeared with a concurrent rise in protein in the rumen contents. With the addition of casein to the hay, starch, and urea ration, the utilization of urea was markedly reduced. The study was conducted with a Holstein heifer from which rumen contents were removed through a fistula after being fed the different types of rations.

Digestibility trials on green fodders, E. HARRISON (*Trop. Agr. [Trinidad]*, 19 (1942), No. 8, pp. 147-150).—Analysis of 96 individual digestion trials with 15 fodders and four cattle each showed that consumption in the Tropics was considerably less than in temperate climates. Wilting was a suggestion to increase the dry matter and as a possible means of preservation. Consumption was increased to about the same as found under normal temperate conditions by the use of wilted elephant grass and para grass. Difficulties of silage making under wet tropical conditions and the use of molasses for preservation are noted.

Wheat as a feed for livestock, R. A. RASMUSSEN (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 4, pp. 1, 4).—A general discussion of the composition of wheat and its possibilities for rations of cattle, horses, sheep, and hogs.

Commercial feeding stuffs, 1941-42, E. R. TOBEY (*Maine Sta. Off. Insp.* 184 (1942), pp. 40).—The guaranteed and found analyses of 695 samples of feeds officially examined in the State are reported.

Inspection of feeds, E. J. DESZYCK, R. W. GILBERT, JR., and R. L. SWALLOW (*Rhode Island Sta. Feed Cir.*, June 1942, pp. 85).—The usual report on the guaranteed and found analyses of feeds officially examined in Rhode Island.

Wildland grazing in northern Michigan, D. L. WEAVER (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 83-93, figs. 14).—A general study of the use of wild land and cut-over land for grazing livestock in northern Michigan, based on a survey of existing conditions on second growth forests and land with few trees and shrubs.

Use of pasture in a feeding program with steers, G. A. BRANAMAN, H. A. FICK, and C. M. HARRISON (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 100-105).—Hereford cattle were divided into three lots for feeding from January 4 to August 28. One group was full-fed continuously in dry lot. The others were fed on alfalfa-brome pasture from May 15. Part of them had access to shelled corn in the self-feeder. The dry lot group made most rapid gains, and the least gains were made by those continuously fed on pasture alone. Because of the minimum labor requirements, the pasture produced as large net returns as most cultivated crops. Pasture when available is recommended for steer feeding.

Wintering steers on crested wheatgrass, R. M. WILLIAMS, R. T. CLARK, and A. R. PATTON. (Coop. U. S. D. A.). (*Montana Sta. Bul.* 407 (1942), pp. 18, figs. 6).—Long yearling steers practically maintained weight when wintered on mature crested wheatgrass pasture with 1 lb. cottonseed-molasses-beet pulp pellets per head daily. When the supplement was increased to 3 lb., gains of

0.34 lb. per head daily were made. In another wintering trial Fairway crested wheatgrass hay cut before the bloom stage, fed with 3 lb. of pellets per day, produced gains of about 1.5 lb. per head daily. Similar groups fed 0.9 lb. of soybean meal with Standard crested wheatgrass hay made gains of 1.3 lb. These conclusions were among those derived from three trials in which steers and calves were wintered for 140, 120, and 112 days, respectively.

Relationship of rate of growth in lambs to body measurements and carcass value, C. L. COLE (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 120-121).—Study of the relation of body measurements to average daily gains in 32 lambs at approximately 85 lb. live weight showed that average width of the individual had the highest relation to rate of gain. However, the most rapid gaining lambs were not necessarily those that graded highest when slaughtered. The thickness of fat over the eye muscle was the most important factor in slaughter grade but had little influence on the rate of gain.

Studies on Merino wool production: The standard of production of a group of plainbodied stud ewes, V. BOSMAN (*Farming in So. Africa*, 17 (1942), No. 191, pp. 88-98, figs. 4).—Good standards of production of total wool, length, and fleece density were exhibited by 50 Merino ewes of the plain bodied type without skin folds. Illustrations of the ewes and details of the number of fibers and fleece weights for each are given.

Protein-mineral-vitamin supplements to barley in market hog rations, E. W. CRAMPTON (*Sci. Agr.*, 21 (1941), No. 10, pp. 613-623).—Groups of 48 January- and 48 May-born pigs of the two sexes were divided for individual feeding and variance studies. Comparisons were also made of supplements to barley rations supplying high and low protein compositions from tankage, fish meal, brewers' yeast, and milk powder from weaning to 70 lb. in weight, from 70 to 110 lb., and 110 lb. to market weight. There seemed no advantage for increasing the crude protein level of the rations above 17 percent when linseed meal and tankage supplied the basis. The early advantages from protein levels above 17 percent were usually lost in the late growth period. The inclusion of fish meal in the protein supplement was recommended unless the cost was prohibitive. The sexes differed significantly in carcass quality and growth response.

Ground alfalfa for brood sows, V. A. FREEMAN (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 148-150).—Continuing studies with sows and gilts (E. S. R., 80, p. 527), comparisons were made of loose alfalfa hay self-fed, with corn hand-fed, and one part of ground alfalfa hay to two parts of ground corn hand-fed. The studies were conducted with about 50 sows and 50 gilts on each ration. During the 112 days after breeding there was no material difference in the farrowing or weaning data between the lots on the whole and ground alfalfa hay. The grain fed to both lots was approximately equal.

Feeding sugar-beet molasses to hogs (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 4, p. 8).—Young pigs were safely fed as much as 40 percent of the ration of sugar beet molasses with 5 percent of hay, or the equivalent of fresh green alfalfa or dried brewers' yeast.

Swine raising in Arizona, E. B. STANLEY, C. L. BELL, and J. T. RIGDEN (*Arizona Sta. Bul.* 185 (1942), pp. 27, figs. 6).—General directions for feeding and management of swine with diagrams of recommended types of equipment.

Nicotinic acid deficiency studies in dogs, A. E. SCHAEFER, J. M. MCKIBBIN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 144 (1942), No. 3, pp. 679-685, figs. 2).—Continuing studies of the effects of vitamin B components on the dog (E. S. R., 88, p. 87), the single dose requirement of nicotinic acid was calculated as 200 γ -225 γ per kilogram of body weight per day for adult dogs and 250 γ -385 γ for growing puppies. The response of the nicotinic acid deficient dog

to nicotinic acid, nicotinamide, dried liver, and liver extract powder feeding was inhibited by sulfapyridine, but the inhibition was overcome by fresh liver. These conclusions were derived from studies of the benefits of daily supplements of nicotinic acid for deficient dogs on the casein-sucrose diet supplemented with components of the vitamin B complex (except nicotinic acid).

The analysis of covariance by the method of individual comparisons, J. B. O'NEIL (*Sci. Agr.*, 22 (1942), No. 11, pp. 721-724).—The methods of carrying out variance and covariance analysis for data on gains in weight and increases in the fat percentage in poultry on two feeds and two supplements at three temperatures previously noted (E. S. R., 88, p. 88) are presented in detail.

Lactobacillus casei ϵ factor in the nutrition of the chick, R. C. MILLS, G. M. BRIGGS, JR., C. A. ELVEHJEM, and E. B. HAERT. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 186-189, figs. 2).—Further study of the factor needed for growth of bacteria and the chick (E. S. R., 86, p. 667) showed that additions of 2 percent of liver extract to a basal ration on which chicks grew poorly supplied all other essential factors and growth was stimulated, hemoglobin formation at 4 weeks was normal, and feathering at 5 weeks was good. A nitrite eluate of the liver proved as effective. Additions of glycine and arginine at adequate levels to the basal ration did not improve feathering or growth.

Lysine requirement of the chick, H. J. ALMQUIST and E. MECCHI. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 174-176).—In one experiment conducted by methods previously noted (E. S. R., 86, p. 666), the additions of 0.8 percent lysine to the basal diet produced gains in five chicks in 7 days only slightly less than were made by positive controls which received casein. In another experiment 0.85 percent supplements of lysine gave practically as good growth as 0.95 percent rations. The third experiment also indicated that the lysine requirement for optimum growth was approximately 0.9 percent of the diet. Edestin, glycine, and *DL*-methionine did not replace the need for lysine.

Nicotinic acid in chick nutrition, G. M. BRIGGS, JR., R. C. MILLS, C. A. ELVEHJEM, and E. B. HAERT. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 59-61).—Continuing studies of deficiencies in chick diets as noted by Waisman and Elvehjem (E. S. R., 84, p. 803), additions of 0-10 mg. of nicotinic acid per 100 gm. of ration increased the growth of chicks up to 3 weeks of age with additions up to 1.5 mg. per 100 gm. of ration. Since the basal ration contained 0.3 mg. of nicotinic acid per 100 gm., it was estimated that the minimum level of the vitamin was 1.8 mg. for optimum growth. The study was conducted with 8 lots of 6-18 chicks each.

Prevention of perosis by biotin, T. H. JUKES and F. H. BIRD. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 231-232).—The symptoms of perosis developing in chicks on rations containing about 30 cc. of raw egg white, as noted by McElroy and Jukes (E. S. R., 85, p. 802), did not develop if the egg white was omitted or if cooked egg white replaced the raw product. The symptoms of perosis were also prevented by injecting approximately 3 μ g. of biotin daily, or in another experiment by injecting the chicks with a total of 13 μ g. of biotin in seven injections. A dose of 0.34 μ g. of biotin per day did not prevent dermatitis, but it induced superior growth and feathering.

Changes in the National Poultry Improvement Plan (U. S. Dept. Agr., Misc. Pub. 300, Sup. (1942), pp. 5).—A supplement to the publication previously noted (E. S. R., 79, p. 91) with corrections to date in the National Poultry Improvement Plan.

Hatching ability of poultry.—III, The market quality criterion—mobility of yolk and hatchability, E. W. HENDERSON (*Michigan Sta. Quart. Bul.*, 25

(1942), No. 2, pp. 151-156, fig. 1).—Continuing this series (E. S. R., 88, p. 237), a relation of hatching power to yolk movement in 2,413 eggs was shown. These results indicated that 73 percent of the eggs hatched from those showing the greatest yolk movement on candling, as compared with 62 percent of the eggs hatched from those which showed the poorest yolk movement. A regression line of percentage hatched on yolk movement is presented.

Broiler production, H. O. WEST (*Mississippi Sta. Bul.* 370 (1942), pp. 90, figs. 25).—This is a revision of Bulletin 335 (E. S. R., 82, p. 527), giving, in addition to compiled data, a summary of feed costs and returns from the production of nearly 30,000 broilers on nearly 25 farms in the Smith, Rankin, and Scott County areas of Mississippi. Surveys are also included of broiler production in other States for comparison and the results of feeding experiments elsewhere.

The structure and quality of eggs, A. M. GERICKE (*Farming in So. Africa*, 17 (1942), No. 191, pp. 117-131, figs. 4).—The interior areas of the membranes, shell, and albumen of the egg are briefly discussed, with special reference to time in the egg cycle.

Feeding and confinement rearing experiment with turkeys during 1941, F. N. BARRETT, C. G. CARD, and A. BERRIDGE (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 138-148).—Continuing studies of turkey production (E. S. R., 86, p. 668), the amount of grain consumed was increased when corn and oats were fed free choice, as contrasted with corn alone with mashes containing 28.6, 32.2, and 22.1 percent protein. Whole oats proved a desirable feed, but corn was consumed heavily as maximum growth was attained and there was greater fattening. The study was conducted with 10 lots consisting of about 25 Small-type Bronze, Bronze, Bourbon Red, Beltsville Small White, and crossbred turkeys each, fed for 26 weeks. The smaller types consumed slightly more feed per unit of gain. The practicability of confinement rearing of turkeys was demonstrated.

Alfalfa meal in turkey rations (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 4, p. 8).—As much as 25 percent alfalfa meal in the mash produced as good or better finish on turkeys as 5-10 percent. There was no apparent advantage for the use of skim milk or wet mash.

DAIRY FARMING—DAIRYING

Report of the Chief of the Bureau of Dairy Industry, 1942, O. E. REED (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt.*, 1942, pp. 26).—Results are briefly reported of work by R. R. Graves of progress made on investigations at the Beltsville Research Center and field stations on the development of improved strains of Holstein-Friesian and Jersey cattle, production of bulls for artificial breeding rings and bull associations, relation of development of mammary gland of calf to milk production in later life, effect of suspension of milking on production, pasturing cattle and feeding tests, silage from alfalfa, and soybeans with and without preservatives for milk production.

C. A. Cary reported briefly for the division of nutrition and physiology on the composition and chemical reaction of milk proteins, further studies of the unidentified nutritional factors in milk and other substances (E. S. R., 88, p. 519), gonad-stimulating plant materials, the vitamin A and carotene values of corn silages, alfalfa, and timothy hays, effect of rations low in vitamin A on reproductive functions and dilution and quality of semen, limiting factors for milk production and growth in grain and timothy hay, and grain and corn silage rations.

Brief results are presented of work by L. A. Rogers on studies of types of bacteria developing in Swiss and Cheddar cheese during manufacture and the cause of low-grade cheese production in the field, sweetness of ice cream, temperature of heating and sterilization of evaporated milk and bacteria present, development of lactic-acid lacquers, and oxidative deterioration of fats in dairy products.

Brief results are reported by E. Kelly on market milk investigations concerned with tests of filter pads and decreases in the tin content of solder for milk cans, substitutes for agar in milk counting on solid media, effect of homogenization on curd tension, digestibility, keeping quality, and flavor, development of oxidized flavor by milk in copper-containing cans when cows received silage as contrasted with dry feed, relation of oxidase-producing bacteria to development of oxidized flavors in milk, and practices of producers and distributors in cooling, bottle washing, refrigeration, and bottle filling.

[**Experiments in feeding dairy cattle by the Georgia Station**] (*Georgia Sta. Rpt. 1942*, pp. 41-44, figs. 2).—Brief results are presented on the use of home-grown roughages in the dairy ration, sweetpotato meal and peanuts on the vine as a milk-producing feed for dairy cattle, and the growth and development of dairy heifers on summer pasture when receiving supplementary concentrates.

[**Investigations of dairy production by the Kansas Station**] (*Kansas Sta. Bien. Rpt. 1941-42*, pp. 40-42).—Brief results are presented on studies showing the deficiencies of sorghum crops as feed for dairy cows, by H. E. Bechtel, F. W. Atkeson, and J. S. Hughes; raising calves on Coyer nipple pail, and production of vealer calves, by A. O. Shaw and Atkeson; effects of evaporation, breeds, etc., on the composition of milk, by W. J. Caulfield and C. H. Whitnah; and fly control, nitrogen, and silage studies affecting dairy production, by Atkeson, Bechtel, Shaw, G. H. Beck, W. M. McLeod, Hughes, and R. C. Smith.

[**Dairy research in Montana**] (*Montana Sta. [Bien.] Rpt. 1941-42*, pp. 25-26).—Work is reported by J. A. Nelson on profitable levels for grain feeding, dry meal v. skim milk powder for dairy calves, and abnormal flavors in milk.

[**Production by dairy cattle and manufacture of dairy products**]. (Partly coop. U. S. D. A.). (*Pennsylvania Sta. Bul. 429 (1942)*, pp. 6-8, 9-10, figs. 2).—Results are briefly presented of studies by A. A. Borland, A. L. Beam, S. I. Bechtel, R. W. Stone, J. E. Nicholas, T. G. Anderson, C. D. Dahle, D. V. Josephson, F. J. Doan, and O. M. Russell on milk produced by cattle fed from 70 to 120 percent of the Haecker standard for milk production; inheritance of milk-producing capacity in institutional herds; the use of corn meal, wilting, salt, mixture with green wheat, mixture with dry sorghum, and mixture with stored beets, and all combinations thereof for preservation of grass silage; well water not ideal as a milk-cooling medium; reducing length of cheese-curing period by new starter; loss of vitamin C in making evaporated milk; dried whole and skim milk and incubation for controlling the oxidized flavor in milk.

Grazing habits of dairy cattle, F. W. ATKESON, A. O. SHAW, and H. W. CAVE. (Kans. State Col.). (*Jour. Dairy Sci.*, 25 (1942), No. 9, pp. 779-784, fig. 1).—Grazing 2 cows on each of six different pastures of about 4 acres each showed that the cows spent slightly less than half their time in grazing on good pasture during the day time. On fair and poor pasture 55 and 62 percent, respectively, of the time was spent in grazing. There was no relation of frequency of drinking to the type of pasture available. In a more detailed study of 56 dry cows and heifers continuously on 30 acres of rye pasture without supplemental feeding, the 24 hr. were spent as an average of 7 hr. in grazing, 4 hr. standing or walking, and 13 hr. lying down. The animals were lying down 35 percent of the day and 80

percent of the night. There were four grazing periods during the day and two at night.

Studies on ketosis in dairy cattle.—I-III, C. B. KNOTT, J. C. SHAW, and G. C. WHITE. ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 10, pp. 837-867, figs. 17).—Three studies in this series are reported.

I. *Effect of stall and pasture feeding upon the concentration of blood and urinary acetone bodies of dairy cattle* (pp. 837-849).—Total acetone in the blood and urine of 3 cows was markedly increased 2-4 hr. following the feeding of grass silage. In several determinations at monthly intervals over 12 mo. with 11 mature cows and 1 mature bull, those receiving grass silage showed a marked increase in the blood and urine acetone bodies. A marked decrease was noted 2-3 hr. later with the return to normal after 9 hr. Through the winter months with heavy silage rations the blood and urine acetone increased, but decreased during the pasture season. Heifers 16-20 mo. of age kept on pasture did not show the increase associated with silage feeding. Variations in acetone bodies were associated with the β -hydroxybutyric acid in the blood and urine. The increase in the acetone bodies during the stall feeding period was more closely associated with grass silage feeding than with any other single factor. Low values were noted in the winter months with hay. The blood acetone of helpers was lower on mixed grass hay than on pasture.

II. *Blood and urinary acetone bodies of dairy cattle in relation to parturition, lactation, gestation, and breed* (pp. 851-860).—Observation of the acetone bodies of 11 lactating cows at monthly intervals over a 15-mo. period showed much variation, but there was a gradual increase in the blood and urine for 90 days after parturition followed by a gradual decline. In 5 cows on which daily observations were made, there was a marked decrease in the urinary acetone bodies during 4 days after parturition, but the decline was not statistically significant at the time when the incidence of ketosis is greatest. Factors other than pregnancy seemed to affect the day-to-day variations in 10 cows at various stages of gestation. No increase in the blood and urinary β -hydroxybutyric acid followed the cessation of milking. Breed differences seemed related to differences in silage consumption. There appeared to be no correlation between milk and blood acetone bodies within the normal range. Highly significant correlations were noted between the blood and urinary concentration of total acetone bodies, acetone and acetoacetic acid, and β -hydroxybutyric acid.

III. *Blood and urinary acetone bodies as related to age* (pp. 861-867).—Study of the blood and urinary acetone bodies of calves at birth and their dams, helpers from birth to 10 mo. of age, and heifers from 9 to 26 mo. of age showed no correlation between the calves and their dams. The acetone bodies were extremely low during the first 7 days following birth, and this condition lasted for the first 2 mo., followed by progressive increase due to β -hydroxybutyric acid. It was also noted that helpers receiving pasture grass alone showed a higher concentration of blood acetone bodies than when receiving hay and grain.

The fat metabolism of the mammary gland of the normal cow and of the cow in ketosis, J. C. SHAW, R. C. POWELL, JR., and C. B. KNOTT. ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 909-921).—In continuing the study of the effect of ketosis and the administration of large quantities of glucose in ketosis on the type of fatty acids in the milk (E. S. R., 84, p. 663), the short chain fatty acids of milk fat increased significantly within 36-48 hr. after administration of 6 lb. of glucose directly into the rumen. However, in severe ketosis the short chain fatty acids are lowered but not as much as in short periods of fasting. On the evidence obtained it appears that β -hydroxybutyric acid is one of the chief sources of energy for the active mammary gland. Removal of

fat and glucose from the blood in its passage through the mammary gland accounted for 92.8 and 105.5 percent, respectively, of the fat and lactose secreted in the milk. The studies were conducted by detailed analyses of the blood and milk fat produced by four cows in five experiments.

Rôle of inositol and *p*-aminobenzoic acid in normal lactation, D. R. CLIMENKO and E. W. MCCHESENEY (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 157-159, fig. 1).—The need of inositol for normal lactation in the rat is emphasized. Five groups of 12 individuals each received a deficient diet supplemented with vitamin B complex, with and without *p*-aminobenzoic acid and inositol singly and in combination. The milk secretion was indicated by the increase in weight of the young. Inositol maintained lactation only slightly less than a control diet and *p*-aminobenzoic acid additions did not increase milk production, but mortality of the young was slightly decreased.

The effect of stilbestrol and anterior pituitary extract upon lactation in goats, A. A. LEWIS and C. W. TURNER. (Univ. Mo.). (*Jour. Dairy Sci.*, 25 (1942), No. 10, pp. 895-908, fig. 1).—In continuation of previous investigations (E. S. R., 86, p. 377), copious and prolonged lactation was induced in virgin and dry goats by the subcutaneous, oral, or percutaneous administration of diethylstilbestrol, or by implantation of pellets of diethylstilbestrol dipropionate. The daily effective doses required by the different methods of administration were oral 5 mg., inunction 4 mg., and subcutaneous 0.25 mg. Anterior pituitary extract augmented the production caused by diethylstilbestrol, presumably from the action on the anterior pituitary gland, causing increased production of lactogen or by initiating lactation in stilbestrol-treated goats. Stopping daily treatments sometimes improved production, but restarting them had little effect. The volume of production was not benefited by hormone treatment of parturient goats. Treatment during the last half of pregnancy was not deleterious to normal parturition and did not have any adverse effect on the health of goats when continued over long periods. Two does were bred out of season after termination of the hormone treatment.

The conversion of surplus wheat into much needed milk, G. Q. BATEMAN (*Farm and Home Sci. [Utah Sta.]*, 3 (1942), No. 4, pp. 1, 11, fig. 1).—Records of the milk production and feed consumption of cows in the experiment station herd showed that as production increased the total digestible nutrients required to produce a pound of butterfat decreased. Chopped wheat was fed at a profit as the single grain with alfalfa hay, but wheat was fed to greater advantage to dairy cows when it made up only a part of the grain mixture. Returns were estimated on different prices of butterfat.

Shark liver oil and the vitamin A potency of milk, L. L. RUSOFF, H. E. SKIPPER, and P. T. D. ARNOLD. (Fla. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 9, pp. 807-813).—The administration of 2.5, 5, and 10 lb., respectively, of shark-liver oil per ton of feed, or 4-6 oz. of this substance per cow, did not raise the vitamin A in the milk above a threshold of about 1,900 I. U. per quart. This amount occurred with the smaller supplement of shark-liver oil. Cows were furnished with these feeds in three groups of two each with four cows kept for controls in two pasture and one dry-lot periods. There was a significant decrease in the vitamin A potency of the milk when pasture was limited. With the shark-liver oil supplement there was a decrease in the fat percentage of the milk, but the vitamin C content was not significantly affected.

The use of laboratory pasteurization in solving milk problems, E. B. BOYCE, H. C. LYTCHGOE, E. K. RUGGLES, and R. LANE (*Jour. Milk Technol.*, 5 (1942), No. 3, pp. 146-151, figs. 2).—Bacteriological counts of milk samples before

and after pasteurization were indicative of the source of contamination. The problem of improving the bacteriological quality of the milk sold in Massachusetts was largely a matter of improving the quality of the farm milk supply, but regular milk inspection must be maintained. The study was based on standard plate counts before and after laboratory pasteurization of milk samples regularly collected.

Prevention of development of hydrolytic rancidity in milk, N. P. TARASSUK and J. L. HENDERSON. (Univ. Calif.). (*Jour. Dairy Sci.*, 25 (1942), No. 9, pp. 801-806, figs. 3).—Mixtures of 80 percent normal milk with 20 percent milk having a high lipolytic activity with the early development of rancidity prevent the occurrence of the rancid flavor. Surface tension and organoleptic tests confirmed each other in supporting these findings. More or less variation in the surface tension occurred with more than 20 percent of the lipolytic milk.

A comparative study of the Frost little plate and standard plate methods for the bacteriological examination of milk, cream, and ice cream, C. S. BRYAN, M. V. SCHEID, M. D. NEUHAUSER, B. L. GILBERT, and G. J. TURNEY. (Mich. Expt. Sta. et al.). (*Jour. Dairy Sci.*, 25 (1942), No. 9, pp. 827-835).—Study of the bacterial counts of 445 samples of milk and cream and 165 samples of ice cream showed that counts comparable to standard plate counts were obtained by incubating Frost little plate samples (E. S. R., 45, p. 175) for 4 hr. at 37° C. in a moist chamber when the counts were made on milk and cream and 8 hr. for counts on ice cream. Dilution of 1-10 or 1-100 are suggested for chocolate, fruit, and nut flavoring in order to differentiate the particles from living bacteria.

Composition and thiamin and riboflavin content of defatted milk solids, C. M. O'MALLEY and E. J. BALDI (*Jour. Milk Technol.*, 5 (1942), No. 3, pp. 138-140).—No relationship was found between the thiamin and riboflavin contents of defatted milk solids in 32 samples from 13 of the major milk-producing States representing widely different geographical districts. The samples were analyzed for moisture, fat, protein, lactose, ash, calcium, phosphorus, thiamin, and riboflavin.

Influence of pH, type of fat, and pancreatic extract upon lipolysis in homogenized milk, I. A. GOULD. (Mich. State Col.). (*Jour. Dairy Sci.*, 25 (1942), No. 10, pp. 869-876, fig. 1).—In a continuation of previous studies (E. S. R., 86, p. 378) the extent of lipolysis was ascertained in series of homogenized butter oil and whey adjusted to pH 4, 5, 6.5, 8, 8.5, 9, 9.5, and 10. There was no lipolysis at pH 4 and 5, and there was great retardation at pH 10. Other trials in which the samples were first acidified and then adjusted to pH 8-8.5 showed that acid treatment adversely and permanently affected the lipolytic activity of whey and it failed to respond to subsequent alkaline treatment. Homogenization of cottonseed oil, castor oil, coconut oil, and other oils and fats with raw and pasteurized skim milk showed milk to contain a nonspecific fat-splitting enzyme capable of producing lipolysis on a wide variety of fats. Homogenization greatly enhanced lipolysis produced by pancreatic extract, whether before or after the addition of the enzyme.

Orthophosphoric acid as a cheese solvent, A. W. TURNER, B. ROGERS, and V. CONQUEST (*Jour. Dairy Sci.*, 25 (1942), No. 9, pp. 777-778).—The extraneous matter in a 50-gm. sample may be ascertained by dissolving the cheese in 500 cc. of hot orthophosphoric acid and filtering.

The use of enzyme-converted corn sirup in the manufacture of bulk sweetened condensed milk, P. H. TRACY and G. EDMAN. (Univ. Ill.). (*Jour. Dairy Sci.*, 25 (1942), No. 9, pp. 765-775, pl. 1).—In samples of sweetened condensed skim milk, corn sugar replacing 50-100 percent of the sucrose was

found to have normal keeping qualities but discoloration was greater. Best results from the standpoint of color and thickening were obtained when the milk and sirup were preheated separately at temperatures limited to 185° F. with storage at low temperatures. In commercial operations the storage temperature did not need to be lower than 60° unless the condensed milk was to be stored more than 3 mo. These results were derived from the study and color quality of samples prepared with 0-42 percent sucrose or corn sirup and preheated at 170°-200° with storage at 40°-90°.

Bacteriological study of chocolate milk, J. E. FULLER, W. S. MUELLER, and R. W. SWANSON. (Mass. State Col.). (*Jour. Dairy Sci.*, 25 (1942), No. 10, pp. 883-894).—This study of chocolate milk, the milk and three sirups, and three cocoa powders from which it was made, showed that cocoa powder contained some factor which inhibited the growth of bacteria ordinarily present in milk except *Streptococcus lactis*. Tannic acid produced a similar effect. Neither oxalic acid or theobromine alone has demonstrable effects on bacterial growths. The limitation of bacterial development was not apparent in chocolate milk made from one chocolate sirup. In the studies the chocolate milk was stored for varying periods up to 7 days. The bacterial counts in chocolate milk followed those changes found in raw milk. The growth-inhibiting factor was evidently lost in the manufacturing process.

Frozen cream as a source of fat in ice cream, M. V. SCHEID, P. S. LUCAS, and G. M. TROUT (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 125-132, figs. 2).—The use of frozen cream as the sole source of fat in ice cream retarded the whipping ability of the mix. There was no difference in the time required for a 90-percent overrun for frozen cream held 1, 3, or 6 mo. A 90-percent overrun was obtained more easily in ice cream when 10 percent sucrose was added before freezing the cream for storage. The delayed whipping with frozen cream was largely overcome by the use of 0.35 percent dried egg yolk. The flavor of ice cream from frozen cream was slightly improved by the addition of egg yolk, and a good flavor was maintained over a longer storage period, but there was no consistent influence of frozen cream on the body and texture of the ice cream. The use of frozen cream in the mix did not raise the bacterial count of the ice cream after storage for 6 mo.

Meeting sugar shortages in preparing ice cream ripple syrups, J. SHEVRING and P. H. TRACY. (Univ. Ill.). (*Ice Cream Rev.*, 26 (1942), No. 1, pp. 18-20).—Study of different ingredients showed that satisfactory wartime commercial ripple gelatin can be made by 20 percent fruit, 0.5 percent pectin, and 35 percent sweetening on a solids basis from invert sugar or sirup, corn sirup, honey, or sorghum molasses. These materials also proved satisfactory as replacements for all or part of the sucrose in chocolate ripple syrups.

Substitutes for cocoanut oil in chocolate ice cream coatings, J. J. SHEVRING and P. H. TRACY. (Univ. Ill.). (*Ice Cream Trade Jour.*, 38 (1942), No. 10, pp. 64, 110-112).—The results of tests to find domestic oils and fats that could be substituted for coconut oil in chocolate coatings showed that 8-15 percent of low-melting-point fats and 10-25 percent of high-melting-point fats could be employed. A satisfactory coating for emergency use was made with 10 percent cocoa, 40 powdered sugar, 35 hydrogenated soybean oil, and 15 percent unhydrogenated soybean oil.

Stretching your supply of coating, J. H. ERB. (Ohio State Univ.). (*Ice Cream Trade Jour.*, 38 (1942), No. 10, pp. 26-27, 77-78, fig. 1).—Various supplements to ice cream coating fats are suggested, including lecithin from soybeans as a go-between moisture and fats and confectioner's coating with added fat.

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1942, pp. 2-5, 18-46*).—A progress (E. S. R., 86, p. 676) report of work with Bang's disease; tuberculosis; bovine mastitis; the avian leucosis complex; eradication of scabies and of dourine; anthrax; inspection and quarantine of imported animals and products; infectious equine encephalomyelitis; periodic ophthalmia; swine erysipelas; infectious anemia; miscellaneous diseases; stock-poisoning plants; pullorum disease antigens; disinfectants; tuberculin and other diagnostic tests; anaplasmosis; liver abscesses in feed lot cattle; tick eradication; hog cholera and its control; Johne's disease; and parasites of horses, cattle, sheep, swine, and poultry and treatment for their removal.

[Work in animal pathology and parasitology by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1941-42, pp. 57-61*).—The work of the biennium (E. S. R., 85, p. 104) reported upon by L. M. Roderick, R. P. Wagers, W. W. Thompson, J. H. Whitlock, C. H. Kitselman, H. Farley, V. D. Foltz, L. D. Bushnell, F. W. Atkeson, P. H. Vardiman, and J. E. Ackert relates to equine encephalomyelitis; hemoglobinuria in cattle; canine meningoencephalitis; lymphogenous leukemia; contagious abortion in cattle; anaplasmosis; diseases of feeder cattle; mastitis of dairy cows; poultry disease investigations, including effect of phenothiazine on hemoglobin in fowls, protozoan parasites, pullorum agglutination test, lymphomatosis, fowl paralysis, and trichomoniasis; parasitological investigations with the chicken tapeworm *Railletina cesticillus*; and the resistance of chickens to the nematode *Ascaridia galli*.

[Work in animal pathology by the Montana Station.] (Partly coop. U. S. D. A.). (*Montana Sta. [Bien.] Rpt. 1941-42, pp. 35-37*).—The work of the biennium (E. S. R., 84, p. 668) reported on by H. Marsh relates to the use of iodized salt for the prevention of goiter in newborn pigs, lambs, calves, and colts; dysentery or scours in young lambs; arthritis in lambs; foot rot in sheep; vaccination against "black disease" in sheep; control of Bang's disease in range cattle; and coccidiosis in cattle and feed lot lambs.

[Work in animal pathology and parasitology by the Oregon Station] (*Oregon Sta. Bul. 401 (1941), pp. 17, 22, 23, 30-32, figs. 2*).—The work of the biennium 1939-40 (E. S. R., 82, p. 387) reported upon relates to rumen gases and bloat in ruminants; coccidiosis and infectious laryngotracheitis in chickens; swine erysipelas, *Hexamita* sp., and infectious sinusitis in turkeys; paratyphoid in turkey poults and chicks; stiff lamb disease; pulpy kidney disease, black disease, and progressive pneumonia or "lunger" disease of lambs; diseases of milk goats; fern poisoning in cattle; liver fluke in cattle, sheep, and goats; and lungworms.

[Work in animal pathology by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 429 (1942), pp. 8, 26*).—Work on the cause of calf pneumonia and the effectiveness of sulfapyridine in the treatment of calf pneumonia and sulfaguanidine in the treatment of scours is noted by W. T. S. Thorp. D. R. Marble reports on selection and culling as a control measure for fowl paralysis.

A study of the phenomenon of erythrocyte sedimentation.—I, A critical survey of literature. II, The establishment of a reliable measurement of the phenomenon—its reproducibility and limitations, R. E. NICHOLS (*Jour. Lab. and Clin. Med.*, 27 (1942), Nos. 10, pp. 1317-1327; 11, pp. 1410-1422, figs. 6).

The chorioallantoic membrane of chick embryos and its response to inoculation with some mycobacteria, M. MOORE (*Amer. Jour. Pathol.*, 18 (1942),

No. 5, pp. 827-847, figs. 25).—Strains of human, bovine, avian, fish, and snake tubercle bacilli and of rat leprosy bacilli were inoculated in the chorioallantoic membrane of the developing chick, and the histopathogenesis of the lesion which they produced was studied and differentiated. It is concluded that the type of reaction and the degree of response of the membrane to the inoculum serve to determine virulence in a relatively short time.

"Sulfasuxidine" succinylsulfathiazole in veterinary practice, A. H. BRYAN (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 790, pp. 22-26).—This contribution includes canine and feline case reports which, from a clinical standpoint, indicate that succinylsulfathiazole as compared with other sulfonamides is non-toxic even in large dosages and may be given to small pups with safety. It may retard the progress of catarrhal, respiratory, and nervous forms of distemper, but is not as effective as sulfadiazine or sulfathiazole in bringing about a prompt cure of the disease. It is useful in bacillary dysenteries and paradysenteries of the dog and cat and is indicated in food poisoning cases. It is particularly effective in controlling dysenteries of pups and thereby reduces the mortality. Succinylsulfathiazole is not absorbed to any extent by the blood stream. It acts bacteriostatically on the intestinal micro-organisms, particularly on the coliform group and possibly on the spore-forming anaerobes. Marked decreases were noted in the number of coliform intestinal organisms following the administration of medium or maximum doses. The drug appears to be effective against certain pathogens of the intestinal flora. Because of the lack of absorption into the blood stream, this drug may be considered the least toxic of all the sulfonamide drugs and may, therefore, be administered in double dosages in severe enteric cases.

The action of sulfanilamide compounds on the lethal factor of bacterial toxins, S. H. HUTNER and P. A. ZALL (*Science*, 96 (1942), No. 2503, pp. 563-564).—Sulfanilamide compounds were found to protect mice against multiple lethal doses of purified *Salmonella* endotoxin. This protective action is inhibited by *p*-aminobenzoic acid.

The sulfonamids—therapy in practice, J. A. S. MILLAR (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 790, pp. 51-56).

Sulfaguanidine in veterinary medicine (*Vet. Bul. Lederle*, 11 (1942), No. 2, pp. 27-31, fig. 1).—A review of the literature on sulfaguanidine employed in the treatment of white scours of calves, swine enteritis, enteric infections in dogs and cats, and coccidiosis in poultry and lambs.

Wound healing, A. D. HOLMES (*New England Jour. Med.*, 227 (1942), No. 24, pp. 909-921).—A review of the literature, with a list of 146 references.

Brucellosis: Studies emphasizing strain variation in serologic testing, F. E. ANGLE, W. H. ALGIE, and D. MORGAN (*Jour. Lab. and Clin. Med.*, 27 (1942), No. 10, pp. 1259-1263, figs. 3).—A series of 34 patients diagnosed as having chronic undulant fever were examined, agglutination and opsonocytophagic tests being applied. Marked variation in both agglutinin titers and opsonocytophagic indices were found, which indicated the necessity for standardization of *Brucella* polyvalent antigens for agglutination tests. Testing with 5 to 10 smooth strains for cyptophagic activity is necessary to obtain reliable results.

A staining procedure for use in the *Brucella* opsonocytophagic test, N. B. McCULLOUGH and L. A. DICK (*Stain Technol.*, 17 (1942), No. 4, pp. 153-155).—Description is given of a staining procedure which is recommended for use in the *Brucella* opsonocytophagic test in order to avoid confusing results obtained with stains of the Hasting or Wright type.

Intranasal and intraperitoneal infection of the mouse with *Coccidioides immitis*, M. TAGER and A. A. LIEBOW (*Yale Jour. Biol. and Med.*, 15 (1942), No. 1,

pp. 41-59, figs. 17).—The comparative effects of intranasal and intraperitoneal infection of the mouse with the *C. immitis* fungus are presented.

Foot and mouth disease, A. E. CAMERON (*Canada Dept. Agr. Pub.* [737] (1942), pp. 14, figs. 6).

Johne's disease in farm animals, D. F. EVELETH and R. GIFFORD. (Ark. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 790, pp. 27-34, fig. 1).—In continuation of earlier work (E. S. R., 88, pp. 100, 243) record is made of the finding of swine, sheep, goats, horses, mules, and cattle to be sensitive to the intradermal Johnin test. Clinical cases of Johne's disease were observed in cattle and sheep but not in the other species. It is considered probable that Johne's disease may act as a predisposing factor in the production of other disease conditions in cattle and sheep.

Ornithosis (psittacosis) in pigeons and its relation to human pneumonitis, K. F. MEYER, B. EDDIE, and H. Y. YANAMURA. (Univ. Calif.) (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 609-615).

Pathological changes in *Listerella* infection, particularly of the eye, L. A. JULIANELLE and E. MOORE (*Amer. Jour. Pathol.*, 18 (1942), No. 5, pp. 813-825, figs. 15).—Studies of the histopathological changes in the ophthalmic response of several species of animals to infection with organisms of the genus *Listeria* are reported.

A practical suggestion for the serological type determination of *Salmonella* organisms, S. BORNSTEIN (*Jour. Bact.*, 44 (1942), No. 6, pp. 719-720).

The pathogenicity of *Streptococcus agalactiae* for mice and treatment with sulfanilamide and a derivative, M. M. KAPLAN, G. W. RAIZISS, and J. C. MOETSCH (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 392-394).—*S. agalactiae*, which is ordinarily nonpathogenic in mice, has shown a marked pathogenicity when passed through a series of mice. The therapeutic action of sulfanilamide and sodium formaldehyde sulfoxylate-sulfanilamide seems to be inhibited in mice infected with *S. agalactiae* in neopeptone blood broth medium. Sulfanilamide and sodium formaldehyde sulfoxylate-sulfanilamide exert a specific therapeutic action in mice infected with *S. agalactiae* in a saline suspension.

Diseases of feeder cattle in Kansas, H. FARLEY (*Kansas Sta. Cir.* 214 (1942), pp. 14).—A practical account of diseases of feeder cattle in the State, including (1) the three infectious diseases shipping fever, keratitis or pinkeye, and coccidiosis or red dysentery of cattle, and (2) several general diseases, namely, cornstalk disease, prussic acid poisoning, mineral deficiency, silage poisoning, malnutrition, photosensitization, ergot poisoning, and bloating.

A baffling disease of Mid-West cattle, A. BRITE (*Vet. Med.*, 37 (1942), No. 9, pp. 386-387, figs. 2).—Account is given of a hemoglobinuria which occurs in the Midwest and is entirely different from post parturient hemoglobinuria and the hemoglobinuria produced by *Clostridium hemolyticum bovis*. The disease affects cattle of all ages and breeds. Post-mortem lesions resemble those of other hemoglobinurias. The main differences are absence of the infarct in the liver as described in *C. hemolyticum bovis* infection and the lack of the advanced degeneration of the parenchymatous organs as observed in postpartum hemoglobinuria. The cause is unknown, but plant poisoning is suspected despite the fact that some cases have occurred in bucket-fed nursing calves and feed lot cattle. Trypanosomiasis have not been ruled out.

The response of "ceased" reactors in Bang's disease to reexposure, B. A. BEACH, M. R. IRWIN, and L. C. FERGUSON. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 65 (1942), No. 11, pp. 523-532).—In the investigation reported only 1 of 16 infected cows which became ceased reactors, the agglutination titers of the serums having become no higher than those of noninfected ani-

mals, aborted its fetus when reexposed to *Brucella abortus*. *B. abortus* was isolated at parturition from only 1 other ceased reactor following their reexposure. In general, the agglutination titers of the serums of the different ceased reactors were either lower or approximately the same during the second as during the first infection. These results, combined with others obtained elsewhere support the general belief that an active immunity to *B. abortus* results from such infection with virulent organisms and indicate that immunity is of a relatively long duration.

The diagnosis of actinomycosis and actinobacillosis, M. S. SHAHAN and C. L. DAVIS. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 321-328, 329, figs. 6).—In studies of 78 animals having these lesions 68 cases were found due to actinobacillosis, and cultures of both infections were obtained from 1 animal. The cases showing lymph node involvement, alone or in combination with other lesions, were all actinobacillosis. Of the 11 animals showing actinomycosis, 6 were bone cases and 5 had lesions of various organs not associated with bone or lymph node involvement. It is pointed out that while the two diseases are commonly considered in the same category from a clinical point of view, technically they are distinct entities. The causative organisms of the two diseases are capable of producing rosettes, but they differ materially in their cultural and morphological characteristics. *Actinomyces bovis* is anaerobic or microaerophilic and gram-positive, while *Actinobacillus lignieresii* is aerobic and gram-negative. Cultural methods, when possible, are the most desirable to differentiate these diseases from other suppurative processes. The authors' studies indicate, however, that a practical differential diagnosis of these two diseases can be made satisfactorily in many, if not most, instances without resorting to cultures. The rosettes in actinomycosis are generally more variable in shape and size and are usually larger than the uniformly small rosettes seen in actinobacillosis. Histologically, the two diseases show similar tissue and cellular reactions and can best be differentiated by the presence or absence of gram-positive organisms within the rosettes. Clinically and post mortem, these diseases may be confused with staphylococcosis (botryomycosis), tuberculosis, coccidioidal granuloma, and lesions produced by *Corynebacterium pyogenes* or other pyogenic organisms. Therefore laboratory examination is often necessary for diagnosis, which is especially important from the standpoints of prognosis and treatment.

Recovery of *Clostridium sordellii* from cattle and sheep, L. R. VAWTER. (Nev. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 382-385, 386).—Report is made of the morphological, cultural, and pathological characteristics of *C. sordellii*, which has been recovered six times during the last 20 yr. incident to the bacteriological examination of the tissues of animals from western Nevada—five from cattle and one from sheep. It has been found at the Nevada Station to be extremely pathogenic for laboratory animals. Three of the five cattle strains were isolated along with either *C. hemolyticum* or *C. welchii* from the liver infarcts or other tissues of cattle dead of bacillary hemoglobinuria. Another cattle strain was recovered along with *C. chauvoei* from the heart blood of a calf dead of atypical blackleg. The lesions found in calves in this outbreak consisted of a severe hemorrhagic gastroenteritis with blackleglike lesions in the pillars of the diaphragm. Recently, another strain of *C. sordellii* was recovered from a fatal post-vaccination infection among Hereford calves. One non-pathogenic strain was recovered along with *C. septicum* from a sheep dead of a braxylike disease near Reno. Although nonpathogenic, the sheep strain is culturally and serologically related to the cattle strains, reciprocal agglutination occurring between them. A fatal infection due to this organism among Here-

ford calves was encountered in March 1941 following their vaccination with a sterile formalized blackleg vaccine. A careful examination failed to disclose the presence of any other anaerobic pathogens. Since *C. sordellii* had been recovered on two occasions some 18 yr. previously from cattle tissues originating on a neighboring ranch, it is believed to be native to that and other regions in western Nevada. It possesses many of the morphological and cultural features that are common to *C. novyi*, *C. sporogenes*, and to a lesser extent *C. hemolyticum*. It is a nonmotile, sporulating anaerobic rod, $1\mu \times 3.5\mu$ – 4.0μ . Young cultures 12 to 18 hr. old are strongly gram-positive. Compared to other well-known pathogenic species of the genus *Clostridium*, the author considers *C. sordellii* one of the most dangerous and to be capable of doing all the damage characteristic of other pathogenic members of this genus.

Experiments on the life history of the cattle lungworm *Dictyocaulus viviparus*, D. A. PORTER and G. E. CAUTHEN. (U. S. D. A.). (Amer. Jour. Vet. Res., 3 (1942), No. 9, pp. 395–400, fig. 1).—In the work reported experimental infections of cattle with *D. viviparus* were established in calves by feeding the infective larvae. An attempt to infect a calf prenatally by feeding infective larvae to the pregnant dam gave negative results. Zinc sulfate solution (sp. gr. 1.18) with Stoll's technic (E. S. R., 63, p. 261; 76, p. 250) was employed to detect larvae in the feces and thus follow the course of infection. "Larvae appeared in the feces in from 21 to 30 days after inoculation; the prepatent period in a yearling previously parasitized was 41 days. The duration of infection, measured from the time of inoculation until larvae of the next generation were no longer being passed in the feces, varied from about 1 mo. in animals ranging from 208 to 342 days old at the time of inoculation to 4 mo. in one calf inoculated when only 6 days old. Reinfection was successful in a 4.5-month-old calf, but only a slight infection was established in one of two short yearlings that were inoculated after worms from a previous infection had been naturally eliminated. No symptoms were observed in primary infection and in reinfection of the older animals. Symptoms such as coughing, difficult breathing, and diminished appetite were seen in the more severe cases following initial inoculation in the younger calves. Intermittent diarrhea was observed in one calf having the most severe infection with lungworms. The gains in weight of infected animals were less than those of uninfected controls. There was no evidence of anemia nor significant change in the number of leucocytes in the blood of animals examined during the course of infection."

The normal cerebrospinal fluid pressure and a method for its determination in cattle, J. F. SYKES and L. A. MOORE. (Mich. Expt. Sta.). (Amer. Jour. Vet. Res., 3 (1942), No. 9, pp. 364–367, fig. 1).—Description is given of a method for measuring the cerebrospinal fluid pressure in bovines. Using this method, it was found that the average pressure in cattle up to 2 yr. of age was 105.1 mm. of saline. The minimum value observed was 80 mm. and the maximum 150 mm. The data suggest that the cerebrospinal fluid pressure of cattle does not vary with age for at least the first 2 yr. of life.

Factors modifying the rate of fermentation of rumen ingesta and their possible relation to bloat in dairy cattle, N. L. JACOBSON, D. ESPE, and C. Y. CONNOR. (Iowa Expt. Sta.). (Jour. Dairy Sci., 25 (1942), No. 9, pp. 785–799, fig. 1).—Investigations in which ingesta obtained from the cow by means of a rumen fistula were fermented in vitro and the gas collected over 24-hr. periods are reported. Having found no basis for bloat as a result of altering the environment of the bacteria in rumen ingesta, the authors have proposed a theory based upon the physical effect of the feed. This theory, however, has not been verified experimentally.

Analyses of gas and ingesta of bloated cattle, R. W. DOUGHERTY. (Oreg. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 401-402).—All gas and ingesta samples taken shortly after death from steers that had died of acute tympanites had relatively high concentrations of hydrogen sulfide, and all ingesta samples were relatively high in histamine content. Existing pressures in the rumino-reticular cavities of the dead animals varied between 72 and 75 mm. of mercury.

A study of the administration of sulfanilamide to the normal dairy cow, I. ZIPKIN, A. K. ANDERSON, and W. T. S. THORP. (Pa. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 329-335, figs. 2).—Report is made of a study of (1) the free and total sulfanilamide content of the blood and milk following the administration of different doses of this drug to normal dairy cows and (2) of the effect on the blood picture, including the erythrocyte, leucocyte, and differential counts and the hemoglobin content. On the low level of dosage 69 percent of the total sulfanilamide found in the milk was present as the conjugated compound, whereas 37 percent was present in the blood as the conjugated derivative. On the high level of dosage 56 percent of the total sulfanilamide was conjugated in the milk, whereas little conjugated sulfanilamide could be detected in the blood on the same level of dosage. Free sulfanilamide distributed itself approximately equally in the blood and milk on both levels of dosage. A slight anemia was produced, with a maximum reduction in the erythrocyte count and in the hemoglobin value of about 20 percent. On the low level of dosage a slight leucocytosis was observed, while on the high level of dosage a marked leucopenia was produced, representing a decrease in leucocytes of 60 percent. A decided increase in the percentage of neutrophils was noted. In addition, atypical and degenerated leucocytes were found in the blood during the height of sulfanilamide administration. The milk production was found to vary inversely with the excretion of sulfanilamide in the milk. The milk flow was reduced by as much as 82 percent. An average decrease in weight of 8.6 percent resulted from the ingestion of sulfanilamide. Individual differences in tolerance toward sulfanilamide were noted in the cows throughout the course of study.

Homogenized sulfanilamide-in-oil in the treatment of bovine mastitis, C. C. PALMER. (Univ. Del.). (*North Amer. Vet.*, 23 (1942), No. 12, pp. 776-779).—A 35-38-percent suspension of sulfanilamide in liquid petrolatum proved to be very satisfactory for introduction into the udder. If a 35-percent suspension is employed each 50 cc. will contain 17.5 gm. of sulfanilamide, which is the correct dose for each infected quarter in an udder of average size. It is recommended that such injections be made once daily for 3 or 4 days. Next in importance is staphylococcal mastitis, which is more important than streptococcal mastitis in some herds. *Staphylococcus aureus* may cause a mild form of the disease that is clinically very similar to streptococcal mastitis. It is also capable of causing an acute mastitis accompanied by extreme toxemia, which may terminate in udder necrosis. Good results have been obtained in treating these cases with sulfanilamide-in-oil when the mastitis is mild or chronic, or when there are marked symptoms of mastitis and toxemia as indicated by elevation of body temperature and loss of appetite. In cases showing symptoms of udder necrosis (gangrene) the treatment is of little or no value. Those cases of necrosis caused by pathogenic strains of *S. aureus* occur most frequently at calving time. If pathogenic strains of *S. aureus* are found it is usually possible to destroy the infection by the sulfanilamide-in-oil treatment and thus prevent the very serious mastitis which otherwise develops soon after calving.

Mention is made of other bacteria capable of causing mastitis which clinically are usually acute. The most common of these are *Escherichia coli*,

Pseudomonas aeruginosa, and *Corynebacterium bovis*. Treatment of these forms is not very satisfactory.

The udder and mastitis, [I], II, W. E. PETERSEN. (Univ. Minn.). (*Holstein-Friesian World*, 39 (1942), Nos. 17, pp. 949-950, 986-987, fig. 1; 18, pp. 1001-1002, figs. 2).

The results obtained with tyrothricin in the treatment of 157 cows with streptococcic mastitis, C. S. BRYAN, M. L. WELDY, and J. GREENBERG. (Mich. Expt. Sta.). (*Vet. Med.*, 37 (1942), No. 9, pp. 364-369, figs. 8).—In the treatment of 157 cows with streptococcic mastitis each infected quarter was infused with 150 mg. of tyrothricin. This resulted in 142 becoming free from the streptococcic infection. Three cows did not drop in milk production upon treatment, while 64 produced from 1 to 50 percent less milk and only 6 cows of 73 dropped between 50 and 90 percent in milk production. All returned to approximately normal milk flow within 21 days. The period of abnormal milk production after treatment of 73 cows was less than 5 days for 57 cows and more than 5 days but less than 14 days for the remaining 16 cows. The standard plate bacteria count of milk produced by 10 cows before treatment and upon recovery after treatment yielded reductions in bacteria count varying from 30 to 99 percent.

Laboratory methods for differentiating *Trichomonas foetus* from other protozoa in the diagnosis of trichomoniasis in cattle, B. B. MORGAN and L. E. NOLAND. (Wis. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 790, pp. 11-15, figs. 21).—Description is given of the procedure to be followed in the microscopic differentiation of *T. foetus* from other protozoan organisms commonly encountered in material received for diagnosis, together with the technic employed in preparing the artificial cultures.

Studies on the etiology and pathology of calf pneumonia, W. T. S. THORP, J. F. SHIGLEY, and M. A. FARRELL. (Pa. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 342-349, figs. 10).—Report is made of histopathological studies of 28 cases of calf pneumonia and bacteriological studies of all but 4. "Hemophilic-like bacteria were consistently isolated from the cases examined. Attention has been called to the marked similarity of the gram-negative organism isolated to *Hemophilus suis*. Attempts to introduce pneumonia in calves by inoculations of the organisms did not meet with consistent or conclusive results. Histopathological studies reveal a characteristic broncho-pneumonia similar to that reported [by Thorp and Hallman (*E. S. R.*, 81, p. 282)]. However, the degree of injury to the bronchioles appeared more severe in the cases that were observed in this study. The numerous giant cells and large mononuclear phagocytes observed in cases of acute pneumonia appear to be in proportion to the extent of injury and necrosis in the terminal and respiratory bronchioles."

[Work with sheep parasites by the Georgia Station] (*Georgia Sta. Rpt.* 1942, pp. 50-51).—The work of the year (*E. S. R.*, 86, p. 831) was again related to worm control in sheep and control of the sheep tick and the sheep louse *Trichodectes ovis*.

The relationship of diet to the development of haemonchosis in sheep, J. H. WHITLOCK, H. P. CALLAWAY, and Q. E. JEPPESEN. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 790, pp. 34-35).

Field test of various anthelmintics used for the treatment of haemonchosis, J. H. WHITLOCK. (Kans. State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 386-391).—Tests conducted on heavily infected farm flocks of sheep in north-central Kansas during the spring, summer, and fall of 1941 to determine the comparative efficiency of anthelmintics in the control of *Haemonchus contortus* are reported. The results gave no evidence that the addition of formalin and

arsenic, nicotine sulfate, or formate to soluble copper salts increased the efficiency of copper sulfate against this parasite. Phenothiazine is significantly more effective than copper compounds although it sometimes fails in acute cases of stomach worm disease, but the results obtained indicate that it does not fail as often as copper sulfate. This led the author to recommend it guardedly for treatment of acute hemonchosis, and since it is expensive and difficult to administer it is considered a good policy to use it only in the acute cases within an infected flock. Copper sulfate should be expected to remove satisfactory numbers of *H. contortus* in the majority of cases. Because of the low cost, toxicity, and ease of administration 10 percent copper sulfate solution in the dosage of 1 cc. per 10 lb. of body weight, preceded by from 1 to 2.5 cc. of the same solution depending upon weight, is the treatment of choice whenever the problem consists solely of removing *H. contortus*. This means that it is recommended in chronic hemonchosis and as the drug to be used in monthly treatments to prevent the disease.

Preventing lamb losses, F. THORP, JR., (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 136-137).—The importance of and means of preventing losses of lambs from diseases are considered.

Parenchymatous goiter in newborn goat kids, W. G. LOVE. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 789, pp. 484-487, figs. 6).—A brief discussion of normal and hyperplastic thyroid glands is followed by a report of four cases of thyroid enlargement in newborn kids born of dams on a *Brucella melitensis* exposure experiment. Three of the kids were born dead, and the fourth died shortly after birth. Gross and histopathological studies received consideration, and upon these bases a diagnosis of parenchymatous goiter was made. The probable etiology of the disease is suggested.

Parasites of moose in northern Minnesota, O. W. OLSEN and R. FENSTERMACHER. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 403-408).—This digest includes a key for the field identification of the parasites known to occur in North American moose and a list of 26 references to the literature cited.

The longevity of encephalomyelitis immunity induced in horses by vaccination, H. W. SCHOENING, M. S. SHAHAN, L. T. GILTNER, and O. L. OSTERN. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 102 (1943), No. 790, pp. 18-21).—Three horses receiving two subcutaneous 10-cc doses of western equine encephalomyelitis vaccine and two of three horses given the same vaccine intradermically in two doses of 1 cc. each survived intracerebral inoculation of encephalomyelitis virus 8 mo. afterward. The results were the same when the same number of similarly treated horses were exposed 13 mo. after vaccination, though there were indications that the immunity was waning at the later time. A brief general discussion of the subject of vaccination against the disease is offered.

Studies on congenital transmission of equine infectious anemia, C. D. STEIN and L. O. MORT. (U. S. D. A.). (*Vet. Med.*, 37 (1942), No. 9, pp. 370-377, figs. 4).—Following a review of the knowledge of hereditary transmission of infectious anemia, evidence is presented indicating that transmission of the disease from an infected mare to its offspring may occur during intrauterine life. The findings reported indicate that (1) the milk secretion of mares and the semen of stallions affected with infectious anemia may contain the virus; (2) a normal colt may acquire the disease from nursing an infected mare; and (3) an inapparent form of the disease may be set up in a normal horse by the injection of tissue suspensions from a colt so infected. The presence of the virus in the blood of a carrier that had shown no clinical symptoms for more than 6 yr. subsequent

to acquiring the disease was demonstrated. Attempts to transmit the disease by coltus, by repeatedly breeding a normal stallion to two infected mares, were negative.

Abnormal capillary resistance in swine suffering from an inherited bleeding disease, E. T. MERTZ. (Mo. Expt. Sta.). (*Amer. Jour. Physiol.*, 138 (1942), No. 1, pp. 136-139, fig. 1).—The results of the work conducted give evidence that the capillary resistance in swine suffering from an inherited bleeding disease is abnormally low.

Sulfaguanidine in the treatment of infectious enteritis in swine, H. C. H. KERKAMP and M. H. ROEPKE. (Univ. Minn.). (*Vet. Bul. Lederle*, 11 (1942), No. 2, pp. 35-36, fig. 1).—Preliminary tests of sulfaguanidine in enteritis in swine indicate that an effective dose is within the range of 0.165 to 0.33 gm. per kilogram of body weight, and no ill effects were noted with dosages below 0.66 gm. In general, the diarrhea was checked and the feces returned to normal consistency by the fourth or fifth day, and the treatment was continued for an additional 3 or 4 days before the animals were released. A corresponding improvement in physical condition occurred.

A study of thiamine deficiency in swine, together with a comparison of methods of assay, M. M. WINTROBE, H. J. STEIN, M. H. MILLER, R. H. FOLLIS, JR., V. NAJJAR, and S. HUMPHREYS (*Bul. Johns Hopkins Hosp.*, 71 (1942), No. 3, pp. 141-162, figs. 6).—In the experiments conducted thiamin deficiency was produced in pigs given crystalline vitamins as their chief source of the vitamin B complex. "The chief symptoms observed were anorexia, vomiting, dyspnea, cyanosis, and great weakness. The symptoms of cardiac failure appeared suddenly and unless thiamin was given resulted promptly in death. Unexpected death occurred in some instances without dyspnea and cyanosis having been observed. Impairment of growth was not a prominent sign in pigs dying early of acute thiamin deficiency. In all the animals dying as the result of thiamin deficiency, focal necroses of the myocardium were observed. No neurological symptoms were observed nor were any degenerative changes in the nervous system found even in animals in which thiamin deficiency of long duration was produced."

Distemperoid virus as an immunizing agent against canine distemper, O. STADER and R. R. SLAUGHENHAUPT (*North Amer. Vet.*, 23 (1942), No. 12, pp. 782-784, 790).—Report is made of the use of the so-called distemperoid virus, consisting of true canine distemper virus serially passed through a sufficient number of ferrets (50-60) to eliminate its pathogenicity for canine tissue. This virus vaccine (distemper vaccine—ferret origin—Green method) has been produced after 15 years' research by R. G. Green with a view to controlling distemper in the fox, over 500,000 of which and several thousand dogs having been immunized. The results of the authors' vaccination of 385 dogs in four groups, according to the milligram dose received, are reported. It was found that dogs, unlike foxes, require much larger doses (15 mg.) in order to develop rapid immunity. This product has in no instance caused true distemper, but when the dose is small (2.5 mg.) and immediate exposure to true distemper follows, the immunity response is not sufficiently rapid in some instances to prevent the true virus from gaining control. It is entirely feasible when 15-mg. doses are used to immunize dogs and hospitalize them immediately. When 15-mg. doses are used the clinical reactions are so slight as to go unnoticed by the owner in most instances. In the cases reported the immunity produced appears to be of long duration, probably lifelong.

Distemper inclusion bodies, E. A. WATSON and P. J. G. PLUMMER (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 350-357, fig. 1).—The eosinophilic cell-inclu-

sion bodies here described are frequently found present in certain tissues of ferrets, foxes, and mink when these animals are in the end stages of or dead from experimental distemper, or in natural enzootics of the disease. "The inclusions were most frequently seen in the epithelium of the urinary tract (kidney, pelvis, and bladder), occasionally in the epithelium of the bile ducts of the liver and of the gall bladder, but never in the tissues of the brain, trachea, lungs, spleen, stomach, and intestines. Cell inclusions were detected in from 25 to 65 percent of infected ferrets, the percentage varying in groups infected with different virus strains, and in approximately 33 percent of mink and foxes. Positive findings could not be made in ferrets killed during the incubative stage of infection, but were obtained in increasing number and percentage as the disease advanced to the final stage and were highest in animals which actually succumbed to it. The inclusions were almost invariably intracellular and cytoplasmic. Very rarely an inclusion was seen which might have been intranuclear or only apparently so by its location on or under the cell nucleus. Only negative findings were obtained in ferrets artificially immunized with distemper viruses and killed in from 2 to 16 days after a later inoculation of virus and in immunized foxes similarly treated and killed after time intervals of 50 to 180 days. Cell inclusions similar in all respects to those found in 1 of a group of 11 normal healthy ferrets were taken from a colony rigidly isolated from infection and in 2 mink which died of a disease not caused by distemper."

The use of grain containing tarweed (*Amsinckia intermedia*) seed as poultry feed, E. C. McCULLOCH. (Wash. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 789, pp. 481-483).—In further studies of tarweed (E. S. R., 85, p. 823) the seed of this plant in the amounts occurring in unscreened western wheat was not toxic for poultry. Even 14 percent of the seed in the ration was not toxic when fed for as long as 100 days during the period of most rapid growth. However, feeding experiments extending over much longer periods and to laying hens and breeders must be conducted before the possibility of toxic effects from the feeding of this seed to poultry is eliminated.

Combating chick diseases, E. JUNGHER. (Univ. Conn.). (*Northeast. Poultry Prod. Council, Ann. Mtg. Proc.*, 1941, pp. 77-81).

Studies of the hemoglobin content of chicken blood and evaluation of methods for its determination, R. A. BANKOWSKI. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 373-381, figs. 2).—Comparative studies of the adaptability and the relative accuracy of the Dare, Haden-Hauser, and Sheard-Sanford methods, the modified Newcomer method, and new photometric acid hematin and photometric alkaline hematin methods for the determination of hemoglobin in chicken blood are reported. "The modified Newcomer method and the new photometric acid hematin method gave the most consistent results and are considered as most suitable for the determination of hemoglobin in chicken blood. The hemoglobin content of the normal 6- to 8-week-old White Leghorn chickens was established as 9.71 ± 0.83 gm. and 9.83 ± 1.00 gm., respectively, by the modified Newcomer and photometric acid hematin methods. The Dare, Haden-Hauser, and Sheard-Sanford methods were found to be unsatisfactory for determination of hemoglobin in chicken blood. The photometric alkaline hematin method gave variable hemoglobin values which averaged 2.25 gm. per 100 cc. of blood higher than those obtained with the modified Newcomer and photometric acid hematin methods. Both the variability and higher hemoglobin values are believed to be due to the presence of nonhemoglobin constituents of blood in the alkaline hematin solution."

A list is given of 57 references to the literature.

Suggestions for the use of sulfathiazole in the prevention and treatment of infectious coryza (*H. gallinarum*), J. P. DELAPLANE. (R. I. Expt. Sta.). (*Vet. Bul. Lederle*, 11 (1942), No. 2, pp. 43-45, figs. 2).—Sulfathiazole was effective in the prevention and spread of *Hemophilus gallinarum* and in treating infected birds.

Studies on the production of specific antibodies against the agent of fowl leucosis, C. D. LEE. (Iowa State Col.). (*Amer. Jour. Vet. Res.*, 3 (1942), No. 9, pp. 336-341).—"Immunization of ducks and turkeys by repeated injections of leucosis material produced a serum capable of inhibiting or neutralizing the infective agent or infective power of leucosis cells. The immune serums from ducks and turkeys not only neutralized the cell-free agent but the cell-bound agent as well. Immune serums from ducks injected with myeloid leucosis blood were also able to inhibit or neutralize the agent of the neural type of the fowl leucosis complex. Serums from ducks injected with the neural type of fowl leucosis were able to inhibit the development of the myeloid leucosis type. Neutralization of the agent of one type or form of the disease by duck or turkey serum produced by a series of injections of infectious material from lesions of a different form or type of the complex more closely indicates the possibility of a single etiology. Blood from turkeys or ducks that were not injected with material from cases suffering from the fowl leucosis complex did not contain inhibitors for the agent of fowl leucosis. The blood from recovered birds or from birds that failed to take when inoculated with viable material was able to neutralize the agent of fowl leucosis."

Spontaneous ornithosis (psittacosis) in chickens the cause of a human infection, K. F. MEYER and B. EDDIE. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 522-525).

A new coccidium, *Eimeria brunetti* n. sp., pathogenic for chickens, P. P. LEVINE. (Cornell Univ.). (*Jour. Bact.*, 44 (1942), No. 6, pp. 722-723).—Under the name *E. brunetti* description is given of a new species of coccidium pathogenic for the chicken. The "sporulated oocysts range in size from 18.1μ - 24.2μ in width \times 20.7μ - 30.3μ , the average being $21.7\mu \times 26.8\mu$. Oocysts appear in the feces at the end of the fifth day after the infective feeding. Oocysts and developmental forms are present in the lower half of the small intestine and in the rectum, cloaca, and caeca. In severe infections the upper half of the small intestine may also be involved. The oocysts are discharged periodically, the greatest elimination being between 9 a. m. and 3 p. m. No gross lesions are found in light infections. Moderately heavy infections produce a catarrhal enteritis with blood-tinged mucous exudate. Quite often there appear on the mucosa short, red, horizontal streaks that extend as ladderlike rows along the length of the affected parts. Coagulation necrosis and sloughing of the mucosa occur in severe infections. Frequently the necrotic mucosa takes the form of a dry, diphtheritic membrane lining the intestinal tract. These lesions may be confluent or focal. The dilated portion of the caeca is usually without lesions aside from erythema of the mucosal ridges. On the other hand, the constricted, proximal, tubular entrances to the caecal pouches become markedly dilated and plugged by short caseous cores." Cross-immunity tests indicate that it is different from previously described species with which it might be confused. Sulfaguanidine when fed to chickens in the proportion of 0.5 percent of the ration prevented infection. A natural outbreak in a commercial flock of coccidiosis proven to have been caused in part by *E. brunetti* was studied.

Hexamita sp. from the ringed-neck pheasant, W. R. HINSHAW and E. McNEIL. (Univ. Calif.). (*Jour. Amer. Vet. Med. Assoc.*, 101 (1942), No. 789, p. 503).—Report is made of the finding of a species of *Hexamita* morphologically

indistinguishable from *H. meleagridis* in two 8-week-old pheasants (*Phasianus torquatus*) in a pen from which the disease had spread to three other pens. The symptoms described were loss of coordination without noticeable loss of appetite and no diarrhea. In most cases the birds died before symptoms were observed. The mortality in each pen exceeded 50 percent. Reference is made to a case of *Heramita* in a month-old white peafowl, reported by C. U. Duckworth and A. G. Boyd.²

AGRICULTURAL ENGINEERING

Introduction to agricultural engineering, H. E. PINCHES (*Ann Arbor, Mich.: Edwards Bros., 1942, 2. ed., pp. [5]+89, figs. 61*).—The author's purpose is not that of providing another textbook of operation and repair of farm machines, but rather to present and to interpret some principles which underlie the practical and the specialized. The approach is analytical, showing methods of thinking and providing a preliminary acquaintance with a wide variety of problems, in order that an interest may be aroused and a ground work laid from which the student can proceed to more penetrating and independent applications of certain fundamental physical principles to problems of agricultural industry and rural living. An introductory chapter defines the scope of agricultural engineering, dividing this field into three categories—soil and water control, structures, and energy control—indicating the coverage of each category and giving some practical illustrations in each instance. The remaining contents are in two parts, dealing, respectively, with force relations and with energy states and transformations. Part 1 consists of chapters on what are forces and how do they act, the action of external forces on bodies, the action of internal forces, and balancing external and internal forces. Part 2 takes up power and work, power and machinery in agriculture, energy states and transformations, heat, electricity in agriculture, hydraulics, and levels and leveling.

Wartime prices as related to the work of agricultural engineers, R. B. CORBETT. (Md. Expt. Sta.). (*Agr. Engin., 23 (1942), No. 11, pp. 341-343, 346, figs. 2.*)—This is an economic discussion supporting and extending the views of R. W. Carpenter and A. V. Krewatch, set forth in the paper noted below, that the prevention of an economic depression in the period of price collapse tendency following the war is an important responsibility of agricultural engineers, who should prepare now plans for improved farm plant equipment and conveniences as a part of the provision for reemployment of the great numbers now occupied with war work or military service.

Agriculture's big building job, R. W. CARPENTER and A. V. KREWATCH. (Univ. Md.). (*Agr. Engin., 23 (1942), No. 11, pp. 344, 346*).—The viewpoint of the authors of this paper is basically the same as that of the discussion above noted, but emphasis is placed more specifically upon preparation for the improvement or replacement of farm structures. "It is proposed that the land-grant colleges and universities and the U. S. Department of Agriculture be given the facilities necessary to carry on an intensive program of education, demonstration, and technical assistance in the design, remodeling, and construction of farm homes and buildings. . . . At present, less than one-fourth of the States devote the equivalent of one man's full time to extension work with farmers or with county agents on farm building construction problems. It appears that the annual expenditures for specialized agricultural engineering extension work on farm buildings does not exceed \$50,000, and that the total amount spent for direct extension and research work in this field by the State agricultural colleges and

² Calif. Dept. Agr. Bul. 30 (1941), No. 4, pp. 440-456.

the U. S. Department of Agriculture (exclusive of F. S. A. and R. E. A.) does not exceed \$200,000 per year. This is about 3 ct. per farm per year."

[Investigations in agricultural engineering by the Kansas Station]. (Partly coop. U. S. D. A.). (*Kansas Sta. Bier. Rpt. 1941-42*, pp. 26-27).—These included a study of methods of harvesting and storing grain sorghums and factors influencing the quality of wheat during storage, both by F. C. Fenton.

[Agricultural engineering investigations by the Montana Station]. (Partly coop. U. S. D. A. et al.). (*Montana Sta. [Bien.] Rpt. 1941-42*, pp. 33-35).—Irrigation studies, conservation of flood water for range improvement, and the snow survey are among the topics to which brief reference is made by O. W. Monson.

[Agricultural engineering investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul. 429 (1942)*, pp. 3-6, figs. 2).—Reported by A. W. Clyde are experiments showing that the tractor operator may waste one-third of fuel, pressure on landside increases plow draft, and stop-hitches protect plows from breakage. Electric appliances were found, by R. U. Blasingame, to save much farm labor. Devices specifically mentioned are plug-in water heaters, electrically heated pails, use of heating cable for protection of water pipes against freezing, and electric ventilation fans.

Industrial quality of public water supplies in Georgia, 1940, W. L. LAMAR (*U. S. Geol. Survey, Water-Supply Paper 912 (1942)*, pp. III+83, fig. 1).—For each of the public supplies are given data indicating the ownership, source, treatment, storage, and distribution of the water. A total of 157 complete mineral analyses show the chemical character of the water at each place. At places where the water receives chemical treatment other than chlorination, analyses for both the raw and the finished water are recorded. The extremes in total dissolved solids for the ground waters as furnished to consumers were 24 and 1,030 p. p. m.

Making sandbags last longer (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1942*, p. 9).—A standardized technic was developed for determining the ability of certain fungi and bacteria to break down cellulose. This rapid technic may be adaptable to the testing of the effectiveness of rotproofing treatments and making improvements in them.

Soil erosion control practices that meet wartime needs, R. C. HAY. (Univ. Ill. coop. U. S. D. A.). (*Agr. Engin., 23 (1942)*, No. 11, pp. 353-355, figs. 3).—Average corn yields on farms in four counties were found definitely greater when the crop was grown on the contour in 1941. The system for the construction of terraces with a plow is described, and its advantages and disadvantages are summarized. Advantages of the plow terrace method are the facts that regular farm equipment available on nearly every farm can be used, only one operator is required, farmers quickly learn the use of this method, farmers can readily rebuild and maintain terraces by this method, part of the field can be contour plowed while terraces are being constructed, and terraces so constructed are generally well shaped to work with farm machinery. The disadvantages of the method are that terraces constructed have lower ridge heights than usually recommended, i. e., not over 15 in. before settling; steep slopes, over 8-10 percent, cannot be terraced satisfactorily; and construction is slower than by some terracers.

A new development described as the formless concrete flume has, as the essential features making it a structure satisfactory for gully control under both normal and wartime conditions, the advantages of low materials cost, from one-third to one-fourth that of the regular notch spillway dam; low labor require-

ment; permanency; simplicity of construction; the use of high-strength concrete; design as a sloping flume, which requires no support of a vertical wall of earth; and construction without reinforcing steel. On most farms sound soil and water conservation and erosion control practices will make it possible for farmers to contribute more to the war effort, since these practices fit definitely into such a program.

Concrete with minimum of steel, W. G. KAISER (*Agr. Engin.*, 23 (1942), No. 11, pp. 347-348, 351, figs. 2).—The author holds that most concrete farm improvements can be built without the use of reinforcing steel. It is not needed in footings and foundation walls under average conditions, or in the construction of farm-building floors, feeding floors, paved barnyards, runways, sidewalks, and many other flat surfaces. In the case of floors which are likely to be hauled over with heavy loads (or where the floor is built on a new fill), it is good practice to make the concrete slab 6 in. thick. To control cracking, large paved areas should be laid in sections with construction joints extending through the full thickness of the concrete. To make sure that there will be no bond between adjacent sections, a strip of waterproof building paper should be placed against the form face and left in place when the form is removed. Sections 10 ft. square should be satisfactory for most paved areas. For some structural purposes, however, reinforced concrete is required to sustain heavy loads, live and dead, and provide the necessary structural stability as in suspended floors in barns, granaries, and other buildings; walls for large grain bins and for silos; flat slab roofs over underground storage cellars, water storage tanks; check dams and flumes; and some other structures; but while it may not be feasible to eliminate reinforcing steel in such construction, the quantity of steel used can often be very substantially reduced by selecting designs which permit its most efficient utilization. As an illustration of this, the author lists the steel requirements of seven concrete floor designs ranging in steel demand from a two-way slab construction using 3.70 lb. per square foot to a flat slab design needing but 2.13 lb. per square foot. The last-named construction type (the most economical as well as the lowest in steel requirement) is described specifically as a girderless solid slab with drop panels, column capitals, and two-way reinforcement. Increase of allowable stresses on the basis of the improved strength of modern concretes due to better cements, reduction of wall reinforcement needs by provision of more control joints, and other steel-saving measures are also noted.

A tractor level for laying out contour lines, O. J. TRENNY and W. S. PIERCEY. (Wash. State Col.). (*Agr. Engin.*, 23 (1942), No. 11, p. 356, figs. 2).—The level is made up of a 5-ft. piece of 2-in. pipe, on each end of which is an elbow and a 10-in. standpipe. The tops of the standpipes are connected by a piece of $\frac{3}{4}$ -in. pipe, which closes the water channel. The device is mounted on top of the tractor so that it is parallel to the direction of travel of the tractor at all times. The instrument is filled with water so that it rises in the standpipes to one-half their height when the tractor is level. One standpipe is made like the water gage of a boiler so that the water level can be noted. As one end of the level is raised above the other, there is a vertical movement of water in the glass tube, and it is calibrated in degrees so that the operator may easily note the exact grade at which the tractor is operating. By closing two valves, one on either side of the standpipe containing the glass tube, the rapid movement of the water column due to shock and vibration may be damped until there is a gradual movement. The amount of damping may be adjusted to suit the operating conditions. The tractor level is constructed largely from common hardware items. The bottom section consists of a 2-in. piece of pipe, with a

common shut-off valve near the water-glass end. The air line across the top is a piece of $\frac{3}{8}$ -in. pipe with a common shut-off valve near the water-glass end. A detail sectional drawing shows how the glass tube is fastened inside the $\frac{3}{4}$ -in. pipe so there will be no leaks at the top or bottom. Common graphite asbestos water pump packing is used and provides a good seal.

Problem of estimating farm machine needs, O. W. MEIER (*Agr. Engin.*, 23 (1942), No. 11, pp. 352, 355).—This is a brief discussion by the chief of the farm machinery and equipment unit of the Office of Civilian Supply, War Production Board. The author finds that in attaining peak production farmers in general did not lack equipment. Farm machinery sales in 1942, combining production allowed under L-26 and inventories carried over from the previous year, were among the highest on record. Repairs were adequate with few exceptions, and existing machinery is deemed in unusually fine repair. The farm labor situation developed some shortages, but these were primarily in the hand harvesting of crops and hence not of the type which can be alleviated by additional new machinery. The possibilities of obtaining more effective use of farm machinery through cooperative and custom use have remained virtually untapped. Failure to attain 1943 production goals is viewed as less serious than would have been the case had 1942 harvests been less plentiful. Depending upon the course of the war, the materials situation may improve or worsen. It is not impossible that production of more civilian commodities using steel will be cut out altogether, and that the program for farm equipment may be set at even lower levels than the lowest yet recommended. It is imperative that effective programs be initiated to insure the maintenance and maximum use of the equipment which we now have.

Duty of field machines, E. G. McKIBBEN, E. O. HEADY, and J. A. HOPKINS (Iowa Expt. Sta. coop. U. S. D. A. et al.). (*Agr. Engin.*, 23 (1942), No. 11, pp. 357–359, 366–368).—The data dealt with were obtained from about 3,000 farms, constituting about 1.5 percent of the Iowa total. A detailed tabulation shows the use in 1941 of between 35 and 40 types with relation to farm size, and the percentage distribution of a two-bottom tractor plow, per bottom; two-row corn planters (horse-drawn and tractor-drawn), per row; corn pickers (single-row and two-row), per row; and 5- and 6-ft. combines, per foot. The daily performance of some machines was not uncommonly as low as 50 percent of their theoretical capacity calculated on the basis of width and operating speed, but it would appear probable that for most of the machines annual duties of from 150 to 200 percent of the average annual use given should be both feasible and economic. Where farms are larger and topography is favorable, careful management should result in even higher annual duties. The possibility for improvement over the average duty reported is probably not so great for 5- and 6-ft. combines and two-row corn pickers, where programs of extensive custom operation are already the rule. The possibility of custom use probably offers the best possibility of extending the average annual duty of field machines.

Protection for fractional horse power motors, D. E. WIAIT (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 132–135, figs. 3).—The commercially available thermostatic devices are briefly described, together with substitute devices which may be used when the commercial protectors are not available or when the motor is not adapted to their use. One of these consists simply in placing a time-delay fuse of the amperage capacity next above that stated on the name plate of the motor in series with the socket into which the motor is plugged. When time-delay fuses cannot be had it is recommended to insert two sockets in parallel in one side of the motor supply, fitting one with a fuse capable of carrying the starting current and the other with a fuse of smaller capacity. The motor is

then started through the heavier, but run after starting through the lighter, of these two fuses by unscrewing the heavier one from its socket.

Trends in hay production, C. B. RICHEY. (Ohio State Univ.). (*Agr. Engin.*, 23 (1942), No. 11, pp. 345-346, figs. 5).—The author presents, in graphic form and in brief discussion of the significance of the figures shown, data concerning the varieties of hay produced in the United States and the even wider variation in methods of taking up, transportation, and storage. It was observed that equipment used in some parts of the country may be entirely foreign to other sections, and that there are corresponding variations in efficiency in terms of man-hours per ton, "probably represented by the load by hand—wagon—store by hand—barn combination at one extreme and the power buck rake—stacker—stack combination at the other. The hay loader—wagon—fork or sling—barn combination still accounts for more hay than any other method, although farmers are becoming increasingly dissatisfied with it."

Results of a study of trends in methods of hay storage, G. R. SHIER ET AL. (*Agr. Engin.*, 23 (1942), No. 11, pp. 349-351, fig. 1).—Numerous methods and combinations of methods are taken up in a general review.

Chopping saves space and some labor in handling the hay for feeding. It does not reduce weather hazards appreciably, however, and may require more equipment and more labor at haymaking time, although equipment such as the pick-up field choppers supplemented by convenient elevating equipment does not involve a large labor force. Chopped hay reduces fire hazard somewhat in that chopped hay tends to smolder; and fire in chopped hay can often be extinguished or removed from a barn before the building is lost. There is no evidence that chopping hay improves the quality of hay over hay made long, although it may heat and develop a cooked flavor that animals learn to like. Advantages and disadvantages of the ensilage of chopped hay are noted. In mow curing of field-chopped and partly cured hay some difficulty in forcing enough air through the stored mass, due to the increased volume weight resulting from chopping, was encountered, but with laterals more closely spaced (3 ft.) and the use of a volume of air per pound equal to that supplied to long hay it is held possible that the method may be quite successful.

The need for a pick-up baler operating as simply as does the grain binder is emphasized, the mow drying of long hay by forced draft air at natural temperature is briefly discussed, and the importance and probable effect on hay storage methods of the buck or sweep rake is emphasized. In conclusion the report takes up briefly the suggestion that present rapid changes in agricultural methods do not justify the construction of long-lived buildings, but stresses the value of conveniently arranged, durable, long-life buildings that are a national asset in a difficult time.

Potato storages for Michigan, A. D. EDGAR, C. H. JEFFERSON, and E. J. WHEELER. (Coop. U. S. D. A.). (*Michigan Sta. Spec. Bul.* 320 (1942), pp. 39, figs. 16).—Temperature and humidity requirements for best results in potato storage are discussed, together with some other factors to be taken into consideration in designing for new construction or for remodeling. Among handling methods and devices dealt with is an experimental portable elevator conveyor having a 16-in. belt and capable of moving the potatoes either horizontally or upward at an angle to the top of an 8-ft. pile. Work alleys at two levels in the storage building are among other devices intended to lessen mechanical damage in placing the crop in storage. Working drawings for the construction of a 24- by 24-ft. storage with concrete floor, concrete side walls rising from 3 ft. 10 in. below ground level to 1 ft. above ground, either gambrel or gothic-type roof, air-circulation ducts, fill-type insulation, etc., are reproduced, and tabulated cost estimates are given for the remodeling of old storage buildings.

The ceiling drip pans, planned condensation against vapor-protected surfaces, and better-planned circulation and ventilation provisions are emphasized.

Cost of operating mechanical milk coolers, R. L. WITZ. (Coop. U. S. D. A.). (*Indiana Sta. Cir.* 271 (1942), pp. 7, figs. 3).—The results of 21 2-week tests on 7 electric motor-driven milk cooling units showed an average cost of 2.6 ct. per 10 gal. of milk cooled or 5.8 ct. per 1,000 degree-gal. The results of 14 2-week tests on 6 gasoline engine units showed an average cost of 4.0 ct. per 10 gal. or 10.8 ct. per 1,000 degree-gal. It was shown that the competence of the operator is an important item in the operation of manually controlled units and has considerable effect on the cost of cooling with the gasoline engine units. The cost of operation was found to be affected by the difference between the air temperature and water temperature in the storage tank to a degree such that the air temperature surrounding the milk cooler should be reduced as much as possible for economical operation. Coolers operated approximately at full capacity were most economical. Insulation was shown to be necessary to keep operating costs at a minimum.

The electric pig brooder, H. H. SMITH (*Farm and Home Sci.* [Utah Sta.], 3 (1942), No. 4, p. 12, fig. 1).—The brooder described consists of a platform about 40 in. long and 10 in. from the floor built in one corner of the pen and heated by a 100-w. bulb placed over a circular opening about 1 ft. in diameter and covered with a dishpan to serve as a reflector. The platform may be of 1-in. lumber but 2-in. material is considered better, and fencing is to be provided to prevent the sow from getting up on it.

Lamp-type electric pig brooder (*Oregon Sta. Bul.* 401 (1941), p. 30, fig. 1).—An inexpensive brooder is pictured.

[A solar water heater], J. K. ALVIS (*Puerto Rico Sta. Rpt.* 1941, pp. 23-24).—For a family of four a 40-gal. standard range boiler connected to an absorber coil made up of 160 ft. of $\frac{3}{4}$ -in. black pipe will ordinarily be sufficient. The storage tank should be mounted considerably higher than the absorber unit and must be completely insulated with a dry organic material such as sawdust or sugarcane bagasse. The heating coil can be economically laid in a space 40 ft. long in two parallel circuits. On bright days when the usual temperature was about 75° F., water temperatures of 140° have been obtained.

Orchard and potato spray rigs in rural fire protection, C. H. JEFFERSON and G. AMUNDSON (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 94-99, figs. 4).—These farm spray rigs are so similar in their effect upon the water discharged from them to the commercial so-called "fog gun" that they can be used for fire-extinguishing purposes, the mist of minute droplets being much more effective per gallon of water applied and much more rapid in stopping combustion than are solid streams. The lessening of the secondary water damage by the use of spray rather than stream is also noted. The enormously increased water surface in the spray, as compared with that of the solid stream, with the consequent increase in cooling and fire-smothering effect, is explained and is illustrated by derivation of a formula for increase in surface area with decrease in droplet diameter, the calculation of specific instances, and a graph showing surface areas per gallon with decreasing droplet diameter. Two photographs showing the attack on a fiercely burning fire and its extinction in 50 sec. with a spray supplied by an ordinary orchard sprayer are reproduced.

AGRICULTURAL ECONOMICS

[Papers and notes on agricultural economics] (*Jour. Farm Econ.*, 24 (1942), No. 4, pp. 743-895, figs. 6).—Papers are included on: Bases for Controlling Agricultural Prices, by G. Shepherd (pp. 743-760) (Iowa Expt. Sta.); Agricultural

Income and the Export Market, 1910-1940, by M. Clawson and J. D. Black (pp. 761-771); Wartime Wheat Policy in Canada, by H. S. Patton (pp. 772-791) (Mich. State. Col.); Cross-Sectional and Case-Grouping Procedures in Research Analysis, by L. A. Salter, Jr. (pp. 792-805) (Univ. Wis.); Effects of American-Canadian Trade Reciprocity on Agriculture, by R. L. Mighell (pp. 806-821) (U. S. D. A.), with a discussion by R. H. Allen and D. L. MacFarlane (pp. 822-825) (Univ. Ky.); Hired Farm Labor in World War II, by H. Schwartz (pp. 826-844); Control of Consumption in Britain, by B. Brandis (pp. 845-856); Trends in Agricultural Cooperation, by E. A. Stokdyk (pp. 857-865); and Emergency Control in the Farm Real Estate Market, by M. M. Regan and F. A. Clarenbach (pp. 866-882) (U. S. D. A.).

Notes are included on: Regulating Output via Multiple Prices, by S. Enke (pp. 883-889) (Univ. Calif.); Comment on "The Scale of Operations in Agriculture," by W. L. Cavert (pp. 889-890) (U. S. D. A.) (E. S. R., 88, p. 393); Rejoinder to Comments by Cavert, by R. W. Rudd and D. L. MacFarlane (p. 891) (Univ. Ky.); and Some Limitations to Use of Coefficients of Variation, by J. J. Livers (pp. 892-895) (Mont. State Col.).

[Investigations in agricultural economics at the Georgia Station, 1942]. (Partly coop. U. S. D. A.). (*Georgia Sta. Rpt. 1942*, pp. 7-12).—In addition to findings and investigations previously noted, brief findings of a general nature are reported for a farm organization and enterprise study in Bulloch County and a study of cotton marketing.

[Investigations in agricultural economics by the Kansas Station, 1941-42] (*Kansas Sta. Bcn. Rpt. 1941-42*, pp. 10-14).—Brief reports are included on studies by W. E. Grimes, J. A. Hodges, W. H. Pine, R. J. Doll, H. J. Meenen, M. L. Otto, H. E. Myers, H. Howe, G. Montgomery, P. Wilson, R. W. Hoecker, and S. W. Decker as to factors affecting the organization and operation of Kansas farms; the development of an agricultural land-use program for the State (coop. U. S. D. A. and Kans. State Col.); land tenure and related problems; the marketing of grain, livestock and livestock products, and fruits and vegetables; and the economics of the poultry industry.

[Investigations in agricultural economics by the North Dakota Station] (*North Dakota Sta. Bimo. Bul.*, 5 (1942), No. 2, pp. 28-32, 49-50).—Included is an article, Co-operatives Require Knowledge and Understanding, by J. P. Greenlaw, F. B. Daniel, and R. F. Novak (pp. 28-32). It is based on a study of cooperative elevators in all but six counties of North Dakota. The chief objective of the study was "to ascertain group relationship practices and, so far as possible, to determine the relationship between certain practices in the field of group relationships and the success of cooperatives as businesses and as social institutions." The tables of average prices received by North Dakota farmers and the indices of North Dakota agriculture are brought down through October 1942 by P. V. Hemphill (pp. 49-50).

Current Farm Economics, [December 1942] (*Oklahoma Sta., Cur. Farm Econ.*, 15 (1942), No. 6, pp. 173-196, figs. 2).—In addition to the usual review of the agricultural situation and tables on prices, price indexes, and indexes of purchasing power of Oklahoma products, etc., articles are included on Labor Skill Requirements Vary With Types of Farming, by P. Nelson and A. B. Eden (pp. 185-188), and Simple Conservation Practices Are Weapons of War, by E. A. Tucker (pp. 189-182).

Statistical comparisons of record-keeping farms and a random sample of Iowa farms for 1939, J. A. HOPKINS. (Coop. U. S. D. A. et al.). (*Iowa Sta. Res. Bul. 308* (1942), pp. 265-287, figs. 7).—When the results were compared for 1939, the net income per 100 acres varied significantly between the two groups

of farms, with the record-keeping farms well above the random sample. An extra acre on the record-keeping farms added \$9.18 to net income, but on the random-sample farms only \$5.01.

Twenty-one years of Iowa farm records, J. A. HOPKINS (*Iowa Sta. Res. Bul. 309 (1942), pp. 289-352, figs. 29*).—A summary of over 11,000 records kept by Iowa farmers from 1920 to 1940 showed that the record-keeping farmers' gross sales were from 140 to 190 percent above those of the average Iowa farm. The gross income recovered rapidly after the 1921 post-war depression, rising from \$1,700 per 100 acres to \$3,000, a level which was held from 1925 to 1929, declined to about \$800 in 1932, and then recovered to \$2,800 in 1940. Net income followed the same general course. Expenses followed a course similar to gross income, but operating expenses declined only about one-half as much as receipts and tended to lag somewhat behind receipts. Fixed expenses declined from about \$500 per 100 acres in 1920 to \$400 in 1929, then to \$280 in 1933, and rose but little between 1933 and 1940. The value of land and improvements declined from about \$24,000 per 100 acres in 1920 to about \$9,000 in 1933. By 1940 these two types of assets were practically back to their 1920 levels.

Cropper farming in the Coastal Plain, G. W. FORSTER (*North Carolina Sta. Tech. Bul. 73 (1942), pp. 58, figs. 10*).—Data collected on 110 farms between 1928 and 1937 indicated that the average cropper-operated farm studied had approximately 88 percent of its total resources invested in land and 12 percent in livestock, machinery, feed, and supplies. Less than 10 percent of cropland was planted to soil-improving crops. Livestock was largely work stock. About 70 percent of the cropland was devoted to cotton and tobacco. The cropper unit averaged 23.6 acres in 1928, varying from 19 to 48 acres, and the average income per cropper unit was less than \$1,000. The average gross cash income per unit ranged from \$1,034 in 1928 to \$663 in 1940. Net cash income varied from \$770 in 1928 to \$522 in 1940. More livestock and soil-conserving and soil-improving crops are recommended. A reorganized farm, on which the soil was protected and utilized more effectively, indicated an increase in the net income over the usual of approximately \$1,453.

Economic problems of low income farmers in Iowa, L. W. WITT. (Coop. U. S. D. A. et al.). (*Iowa Sta. Res. Bul. 307 (1942), pp. 205-263*).—Among other things, it was found that Farm Security Administration clients operated farms somewhat larger than those of other low-income operators with less current assets in the northeastern dairy and eastern livestock areas and more current assets in the central cash grain and western livestock areas of the State. In all areas, the F. S. A. clients operated their farms more efficiently than did the other low-income operators. The F. S. A. operators had a high volume of business and a low level of operating expenses.

1943 production intentions, Rhode Island, A. L. OWENS (*Rhode Island Sta. Misc. Pub. 14 (1942), pp. [1]+12*).—This preliminary report is based on the analysis of 890 answers in questionnaires distributed to farmers. In the analysis, the farms are grouped by counties and by principal sources of income—dairy, poultry, vegetables, potatoes, and miscellaneous. The estimated 1943 production prospects are expressed in percentages of those for 1942.

Livestock transportation and processing problems in 1942-43 and 1943-44, K. BJORKA, C. L. HARLAN, and F. L. THOMSEN (*U. S. Dept. Agr., Bur. Agr. Econ., 1942, pp. [2]+30, figs. 4*).—The problems are discussed under the following headings: Prospective marketings of livestock, transportation facilities in relation to marketings, hog slaughtering capacity in relation to marketings, possible bottlenecks and difficulties, and alternative methods of meeting a possible emergency.

The marketing of Washington apples in Los Angeles, California.—III, Consumer use and preference, M. T. BUCHANAN (*Washington Sta. Bul.* 423 (1942), pp. 32, figs. 4).—In continuation of these studies (E. S. R., 88, p. 268), it was found that the average monthly consumption of apples per family was 13.9 lb. and the average monthly consumption per person was 4.4 lb. Of the total apples used by the 207 Los Angeles families interviewed, 62 percent were consumed raw, 16 percent were made into applesauce, 11 percent baked, 8 percent used in the preparation of apple pies, and 3 percent used in other ways. Delicious apples comprised 43 percent of all apples consumed without preparation. Next in importance was Jonathan. Consumers were more familiar with varieties used for raw consumption than with those used for cooking and the like.

Statistics on receipts and distribution of sugar in the United States, 1934–39 (*U. S. Dept. Agr., Statis. Bul.* 77 (1942), pp. VII+69).—"In 1934, with the passage of the Jones-Costigan Act, the principal features of which were continued in the Sugar Act of 1937, the Federal Government undertook to exercise comprehensive regulation of the sugar industry. This control included a division of the United States sugar market among the various domestic and foreign areas that supply it; provided for regulation of sugar imports and receipts from offshore areas; and authorized control of distribution of returns among growers, processors, and laborers through a tax-payment program. . . The data published in this report make available for permanent record the current statistics issued periodically by the Department since 1934 in connection with the operation of the sugar legislation, and, in addition, considerable data not heretofore published. Included in the latter are receipts of offshore sugar according to polarization groups and by ports of entry."

The tables are grouped into three sections, as follows: (1) Continental United States deliveries, stocks, receipts, meltings, and production of cane and beet sugar for consumption and export, 1935–39, inclusive; (2) charges against United States sugar quotas for domestic and foreign areas, 1934–39, inclusive; and (3) continental United States receipts of raw, direct-consumption, and liquid sugar, 1938 and 1939.

A study of consumer demand for eggs and poultry in the resort areas of western Michigan, H. P. GASTON (*Michigan Sta. Quart. Bul.*, 25 (1942), No. 2, pp. 162–175, figs. 4).—The principal objectives of the study were "to examine and measure the seasonal variations in demands for eggs and poultry, and to determine the sources of supply." Data were obtained from the managers of representative retail stores, restaurants, hotels, resorts, and poultry dealers located in counties bordering on Lake Michigan. The egg section of 117 and the poultry section of 92 questionnaires, filled in at the time of the interviews, formed the basis of the present report. The seasonal variations in demand for eggs; the sources of supply; the channels of trade; grades of eggs demanded by retailers, hotels, restaurants, and resorts; and storage, etc., of eggs are described. For chickens, the seasonal variation in the demand, sources of supply, channels of trade, types demanded, and the difficulties of procuring suitable and adequate supplies are discussed. Turkeys are considered briefly.

The grades and types of eggs and poultry demanded by the Jewish element, who compose an important part of the resort population, have a marked influence on the production and marketing practices of the area. During the resort season the demand for eggs is over 300 percent and for chickens more than 370 percent of the normal or winter-season demand. Most of the eggs and chickens were produced locally. Hotels and restaurants stored 78 percent of the eggs used under refrigeration. Retailers kept only 21 percent under like

conditions. During the resort season the average hotel and restaurant held eggs 3.4 days before using. The average retailer held them for 3.6 days. More than 50 percent of the chickens used during the resort season were broilers, while only 8 percent of the fowls handled by retailers and 2 percent of those handled by hotels and restaurants were turkeys.

Fluid milk consumption increases with income (*Pennsylvania Sta. Bul.* 429 (1942), pp. 29-30).—A table is included, by C. W. Pierce, showing by the years 1936-41 the population in Allegheny County using purchased milk, the daily sales of fluid milk and fluid cream, and the daily consumption per capita of milk, cream in milk equivalent, and total milk equivalent.

Factors affecting butterfat prices in Kansas, G. MONTGOMERY and F. L. PARSONS (*Kansas Sta. Bul.* 309 (1942), pp. 28, figs. 12).—The trends in butter production, butterfat production in Kansas, the methods of selling butterfat, the establishment of butterfat prices, the seasonal trend of the prices, the causes for the fluctuations in prices, the demand for butter, and the monthly average price at Kansas City are analyzed and discussed.

There is a large variation from creamery to creamery in the general price level of butterfat in Kansas, but where collection is made through local cream stations the price tends to be equal to $1\frac{1}{4}$ times the Chicago prices of 90-score butter in Chicago less collection, manufacturing, and shipping costs of 8 to 10 ct. per pound. Prices paid for direct shipments of butterfat tended to average about 2 ct. per pound more than the prices paid by local stations. Efficiently operated cooperative creameries paid from 5 to 7 ct. per pound above local station prices.

[The rise of retail food prices in Puerto Rico], S. L. DESCARTES (*Puerto Rico Univ. Sta. Mimeog. Rpt.* 20, Supp. 3 [1942], pp. 14]; 4, pp. [5]; 5, pp. [6]; 6, pp. [5]; 7, pp. 6).—These supplements (E. S. R., 87, p. 293) are in Spanish and English. The index number of retail costs of all foods in Puerto Rico rose from 142 on February 17, 1942, to 150 on March 17, 159 on April 14, 170 on May 12, 172 on June 15, and 174 on July 14. The imported foods rose from 161 to 174, 181, 201, 204, and 205, while the locally produced foods rose from 121 to 125, 137, 141, 142, and 144.

Foreign Agriculture, [December 1942] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 6 (1942), No. 12, pp. 385-408, figs. 2).—Included are articles on Bolivian Progress Toward Expanded Agricultural Production (pp. 387-395) and Argentine Grape and Wine Control Program (pp. 396-408), both by L. C. Nolan.

RURAL SOCIOLOGY

Field research and the concept of assimilation, N. L. WHETTEN and A. W. GREEN. (Univ. Conn.). (*Rural Sociol.*, 7 (1942), No. 3, pp. 252-260; *Span. abs.*, p. 252).—This paper reports the testing of the assimilation concept in a study dealing with ethnic group relations in a rural area of Connecticut. So many qualifying factors must be taken into account to measure assimilation that the concept becomes too unprecise to be of value in scientific research. A few of these factors are: The class structure, rural-urban differences, and the heterogeneity of cultural values. Diversification is so great along some of these lines that it is impossible to recognize "assimilation" in the field.

Size as a factor in population changes of incorporated hamlets and villages, 1930-1940, S. C. RATCLIFFE (*Rural Sociol.*, 7 (1942), No. 3, pp. 318-328; *Span. abs.*, p. 318).—Hamlets and villages are divided into four classes and the percentages which lost population computed. Causes of population changes are discussed; a review of the changes for five decades is presented; and a possible future development is stated.

Population rises less rapidly as State ages (*Pennsylvania Sta. Bul.* 429 (1942), p. 31).—It is shown by H. R. Cottam that the rate of population increase in the State is slowing down. For the first time, between 1930 and 1940 the rural population grew at a faster rate than the urban. The average age is rising.

Agrarian conflicts in New York and the American Revolution, I. MARK (*Rural Sociol.*, 7 (1942), No. 3, pp. 275-293; *Span. abs.*, pp. 275-276).—Feudal forms in colonial New York existed, though they were not as profound in influence as were phases of the land system not strictly feudal. Thus an oppressive economic dependence was reflected in small farmer obligations and insecure tenure. Furthermore, the concentration of land ownership nurtured a landed aristocracy who flourished in a congenial legal and political milieu in which monopoly of land and office was securely maintained. Of these possible seeds of agrarian unrest, only the nonfeudal ones sprouted into violence in colonial New York. The Revolution had undeniable effects upon the land system, particularly in sweeping away lingering feudal forms though not the continuing oppression of the small farmer.

Changes in rural life growing out of the war, B. RYAN and C. A. ANDERSON. (*Iowa Expt. Sta.*). (*Rural Sociol.*, 7 (1942), No. 3, pp. 239-252; *Span. abs.*, p. 239).—Effects of the war upon four aspects of rural life are presented—population trends and migration, urbanization of rural culture, community organization, and the role of agriculture among the great groups within the Nation. War will depress rural fertility by virtue of mobilization, urban migration, and urbanization of family attitudes. Migration will be more diffused than in 1917-18 and greater in volume. The prospects for post-war industrial conversion are favorable enough to anticipate a limited back-to-the-land movement. The rural community will temporarily be more integrated, but the total effect of the war will be to increase secularization. Some resurgence of nativistic nationalism, particularly in rural areas, may be anticipated. Farmers as a national pressure group will find their recent favored status and subsidies threatened after the war. New welfare policies will probably favor the disadvantaged groups of farmers rather than commercialized farmers.

Culture change in southern Illinois, H. PASSIN (*Rural Sociol.*, 7 (1942), No. 3, pp. 303-317; *Span. abs.*, p. 303).—This article deals with the process of culture change in Stringtown from a "neighborhood" to a "town-country" stage, with particular reference to the relations between economic changes and other cultural changes in the community.

A study of factors affecting the social well-being of rural people in Kansas, R. C. HILL. (Coop. U. S. D. A.). (*Kansas Sta. Bien. Rpt.* 1941-42, pp. 14-15).—The results indicate a decline in farm population, a decrease in the number of births and in the number of deaths, a decline in movement from farm to farm, and an increase in the migration from farms to cities in 1941.

How satisfying is rural life? L. NELSON and E. McVOY. (Minn. Expt. Sta. coop. U. S. D. A.). (*Rural Sociol.*, 7 (1942), No. 3, pp. 261-267; *Span. abs.*, p. 261).—This study reports an attempt to measure the relations of rural people to the kind of life they lead in Isanti County, Minn. The random sample included both farm and village women. The results indicate that degree of satisfaction with items of family living is related to economic status, place of residence (village or farm), nativity, age, education, family composition, social participation, and general social adjustments. Farm women showed higher dissatisfaction on all categories of family living than did the village women. Security was apparently the item of greatest dissatisfaction among village women, with clothing ranking first in the case of farm women. Lowest dis-

satisfaction score for both farm and village women was _____ after of social participation.

The problem of rural housing in the South, T. G. STANDING. (U. S. D. A.). (*Rural Sociol.*, 7 (1942), No. 3, pp. 267-275; *Span. abs.*, 268).—Programs for the improvement of rural housing should recognize geographic and cultural variations, but the structure of the dwelling should be determined primarily by the needs of the family. An effective program of rural housing improvement will require some form of public subsidy. With proper planning such a program might well help to lessen the shock of conversion to a peacetime economy following the war.

Selected farmer attitudes, A. L. BERTRAND (*Rural Sociol.*, 7 (1942), No. 3, pp. 294-303; *Span. abs.*, p. 294).—This is a study of farmer attitudes and attitude differentiation between agricultural planning community committeemen and noncommitteemen in Grant County, Ky. In attitude and opinion, the committee members exhibited a relatively consistent pattern of differentials from the general belief of their neighbors. Compared to noncommittee members, committee members have a more general belief that education makes young people better farmers; are more consistent in their suggestion that rural living levels have become somewhat higher and that rural satisfaction has increased during their generation; more often believe that the production of their farm has increased since the conservation program; express a more general belief that farmers did not have prior knowledge of conservation problems; and more frequently indicate an anticipation of permanent tenure. They are in more complete agreement that land use has changed for the better since the adoption of the Federal programs, and are relatively more favorable in the evaluation of the Agricultural Adjustment Administration.

Social and ecological patterns in the farm leadership of four Iowa townships, B. RYAN. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 306 (1942), pp. 141-202, figs. 3).—The author found that traditional bases of confidence were reinforced by recognition of ability, while technical bases of trust were relegated to an advisory capacity. No evidence was found that the farmers studied would escape from a democratic conception of planning and action through reliance upon bureaucratic stimulation and direction.

The rural youth of Ross County: Their level of living and social achievement, A. R. MANGUS and R. L. McNAMARA (*Ohio Sta. Bul.* 635 (1942), pp. [1]+27, figs. 7).—This study, which included interviews with 1,602 rural youths 18 to 27 yr. of age, showed that wide differences in living standards are found among rural youths when divided into different advantage groups on the basis of certain facilities and conveniences in their homes. Advantaged male youth had from 1.1 to 1.9 times greater advantage of obtaining full-time employment. The most disadvantaged young women had married in larger proportions, and had borne nearly four times more children than the more advantaged married women. Attitudes of satisfaction, optimism, or enthusiasm among youths increased as their level of living increased.

Will we help youth preserve democracy? R. W. ROSKELLEY, P. M. BERRY, and G. E. KLIPPLE. (Coop. Colo. State Col. et al.). (*Colorado Sta. Bul.* 473 (1942), pp. 47, figs. 15).—This is an analysis of the problems of youth in two rural towns in Colorado, beginning in 1936, and dealing with personal characteristics, migration, employment, economic status, and participation in organizations and leisure-time activities. Some suggested projects for study are included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The earth and man: A human geography, D. H. DAVIS (*New York: Macmillan Co.*, 1942, pp. XXIII+675, figs. 452).—This textbook, designed for first-year classes in colleges and universities, contains data on many subjects pertaining to agriculture, such, among others, as soils; drainage; forests and forest industries; deforestation; grasslands and grazing; primitive, oriental, and occidental agriculture; climatic elements and classification; and weather prediction.

Slidefilms of the U. S. Department of Agriculture (*U. S. Dept. Agr., Misc. Pub. 506* [1942], pp. IV+24).—A catalog and price list of the slidefilms of the Department. The films are listed alphabetically by topics.

FOODS—HUMAN NUTRITION

[**Foods and nutrition at the Bureau of Home Economics**] (*U. S. Dept. Agr. Bur. Home Econ. Rpt.*, 1942, pp. 3-7).—This annual report (E. S. R., 86, p. 700) summarizes the analytical and compilation work on the nutritive value of foods, investigations on the dehydration of foods, and other food-conservation measures.

[**Food and nutrition studies by the Georgia Station**]. (Partly coop. Miss., Okla., S. C., Tex., Va., and La. Expt. Stas.). (*Georgia Sta. Rpt.* 1942, pp. 89-90, 91-92).—This report indicates progress in the continuation of cooperative studies noted earlier (E. S. R., 86, p. 854) concerning the composition of southern-grown vegetables, with particular reference to the mineral content of cowpeas as affected by environmental conditions and the ascorbic acid content of turnip greens as affected by variety, environment, maturity, storage, and cooking. Brief note is also made of results obtained so far in a study of the comparative value of peanut and milk proteins in the diet of the rat. The utilization of peanuts or peanut butter in the human diet to improve its protein value and content of the vitamin B complex is suggested.

[**Research in foods and nutrition by the Cornell Station**] (*N. Y. State Col. Home Econ., Cornell Univ., Ann. Rpt.*, 16 (1941), pp. 29-31, 35-36).—In addition to work noted from other sources, summaries are given for completed studies by A. M. Briant, under the direction of C. J. Personius, on some physical properties of potato starch and their relation to the culinary quality of potatoes; by A. Richetta, under the direction of Personius, on the effect of some physical and chemical properties of egg whites and of other factors on the quality of soft meringues; and by H. P. Leahy, under the direction of K. W. Harris, on dry-milk solids in institution recipes. Progress is also reported in continuance of the project on quality and economy in the selection of potatoes for the institution.

Southern bread enriched with peanut flour (*Food Mater. and Equip.*, 1 (1941), No. 4, p. 6, fig. 1; also in *Bakers Digest*, 16 (1942), No. 8, p. 161, fig. 1).—Peanut flour for human consumption is noted as an additional product providing an outlet for the large quantity of peanut meal resulting from the expanded production of peanut oil. Comparative data on protein, mineral, and vitamin content of patent and whole-wheat flours, peanut flour, peanut and patent flour and peanut and whole-wheat flour mixtures, and enriched flour show the superiority of the peanut flour over the wheat flours in nutritional value. The data indicate that a peanut-patent flour blend (25:75 percent) needs no additional calcium, riboflavin, or niacin, and that substantially decreased amounts of thiamin and iron are sufficient to conform to the standard for enriched

flour. Formulas utilizing this flour blend are reported as having been used with considerable success by bakers in Albany, Ga.

The use of rice polishings in cooking, M. E. HOLLINGER (*Louisiana Sta. Bul.* 355 (1942), pp. 8).—The use of rice polishings in human foods is recommended as a natural and economical method of adding thiamin to the diet. Tested recipes are given, chiefly of baked goods.

Food processing [studies by the Georgia Station] (*Georgia Sta. Rpt.* 1942, pp. 83–85).—This annual report notes progress in the investigation planned with the cooperation of the Tennessee Valley Authority, the U. S. Department of Agriculture, and the British Food Ministry and concerns the preservation of peaches, strawberries, blackberries, and youngberries with sulfurous acid.

[Meat preservation studies by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1942, pp. 6–7).—This annual report makes note of investigations that have been undertaken to develop methods for producing safe, palatable, and nutritious dehydrated beef and for successfully preserving meat by frozen storage.

[Freezer-locker utilization in Pennsylvania] (*Pennsylvania Sta. Bul.* 429 (1942), pp. 31–32, fig. 1).—A survey by W. R. Whitacre of this form of food storage widely used by townfolk, as well as farmers in the State, showed that the more nearly full a freezer-locker is kept the lower the carrying charge per pound of frozen food.

The nutritive value of quick-frozen foods, M. N. GRAHAM (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 8, pp. 243–246, 254).—This brief review points to the great increase in production of frozen fruits and vegetables within the last few years, indicates briefly the main types of freezing methods, deals briefly with the packing and storing of such products, and summarizes findings reported concerning the retention of micro-organisms during storage and the effect of freezing and freezing storage on the vitamin value of the foods.

Preparing fruits and vegetables for the frozen food locker, J. D. WINTER. (Univ. Minn. et al.). (*Minn. Hort.*, 70 (1942), No. 6, pp. 103–105, figs. 3).—General rules are given for the preparation and packing of fruits and vegetables and their juices, together with particular instructions concerning cherries, peaches, plums, and various berries. For dry sugar and sirup packs, the proportion of fruit and sugar (or sirup) is tabulated for standard and medium sugar-saving packs, with indication of the amounts of honey or of extra-sweet corn sirup that may be substituted for a portion of the sugar.

Physical and chemical composition of chickens and turkeys, M. M. HARSHAW. (U. S. D. A.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 6, pp. 365–366).—The data tabulated were compiled from various sources.

Bacteriological survey of canned salmon, O. B. WILLIAMS and E. D. CLARK (*Food Res.*, 7 (1942), No. 3, pp. 178–185).—In the 20-yr. period since the last bacteriological survey of canned salmon a number of changes in packing procedure have been introduced, including the use of a mechanical vacuum in place of the steam exhaust. An examination was made, therefore, of present packs put up by a number of packers and canneries and considered fully representative of commercial canned salmon. The 111 cans of salmon, examined by procedures outlined, included Columbia River Chinook and Alaska salmon (pink, chum, red, and king) obtained from the open market and from warehouse stock. A general consideration of all results, cultural, pH, and organoleptic, led to the conclusion that all cans tested were bacteriologically sterile. It was inferred, therefore, that changes in the packing introduced no new spoilage hazard, and that

the present process is adequate to insure sterilization. Attention was called to the importance of multiple controls in cultural tests for absolute sterility.

The comparative nutritional value of butter and oleomargarine, F. C. BING ET AL. (*Jour. Amer. Med. Assoc.*, 119 (1942), No. 17, pp. 1425-1427).—In this report, authorized for publication by the Council on Foods and Nutrition of the American Medical Association, the evidence on possible differences in the nutritive value of butter and oleomargarine as now produced is reviewed from the standpoint of their energy value, value as a source of essential fatty acids and carriers of fat-soluble vitamins, effect on requirements of other nutrients, and probable value as sources of unidentified factors. On the basis of the evidence reviewed, literature references to which are given as footnotes, it is concluded "that at present there is no scientific evidence to show that the use of fortified oleomargarine in an average adult diet would lead to nutritional difficulties. A similar statement is probably justified in the case of growing children, but preliminary results from animal experiments indicate that more work is necessary before any specific conclusions can be made. Since the nutritional factors have not all been identified, and since butter contains numerous additional fatty acids of unknown nutritional significance, the consuming public has a right to demand that the practice of identifying oleomargarine and butter so that any one can differentiate between them should be continued."

[Nutrition studies by the Kansas Station] (*Kansas Sta. Bien. Rpt. 1941-42*, pp. 61-62).—This annual report (E. S. R., 85, p. 125) presents brief summaries of the following projects, some of which have been noted elsewhere: The vitamin content of food in relation to human nutrition, by B. L. Kunerth, P. Nutter, and B. D. Westerman; the effect upon the animal body of varying amounts of vitamins in the diet, by L. Ascham, Nutter, and M. T. Harman; and the nutritional status of college women, by M. S. Pittman, Kunerth, E. J. Meiller, D. Cederquist, Ascham, and M. Geddes.

Nutrition of humans (*Pennsylvania Sta. Bul.* 129 (1942), pp. 15-16).—This progress report (E. S. R., 87, p. 589) deals with an extension of studies by N. B. Guerrant and R. A. Dutcher on the influence of exercise on the vitamin requirement of the rat, by Guerrant on the storage of vitamin A in the liver of rats, and by the Ellen H. Richards Institute on education as a means of improving vitamin A intake.

Rhode Island food habits, B. M. KUSCHKE (*Rhode Island Sta. Misc. Pub.* 13 (1942), pp. [1]+12).—The findings are summarized of a survey of the food habits of the State as revealed in over 1,600 replies to a questionnaire presented to the members of various groups, chiefly women, such as the Red Cross, college home economics classes, Y. W. C. A. and community classes, Parent Teacher groups, and home demonstration units, and points needing emphasis in educational work among such groups are suggested.

As evaluated by the score card developed by the Extension Nutrition Committee of the American Home Economics Association, only 9 percent of the diets could be rated as fully adequate, about 25 percent as 90 percent adequate, and slightly more than 25 percent as 80 percent adequate. Diets scoring less than 80 percent adequate, comprising 41 percent of the total, were probably deficient in one or more of the food essentials. A few diets scored as low as 20 percent adequate. One of the contributing causes of the low scoring was a very limited use of milk and whole grain cereals. Data of value in helping with the food rationing program were obtained from the records of food purchasing habits.

Significance of the essential fatty acids, G. O. BUER. (Univ. Minn. et al.). (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 1 (1942), No. 2, pp. 224-233, figs. 9).—This review is limited to research dealing directly with the physiological effect of

the essential fatty acids. The significance of the term essential fatty acids is discussed, and the purified acids which have been tested for their activity in curing the fatty acid deficiency syndrome are enumerated, with their positive or negative effects. The subject is discussed further under the headings fatty acid deficiency and its cure by known acids; the daily requirement of the rat and other species for linoleic acid; and other physiological relationships, including vitamin B₆ and essential fatty acids, egg white injury or biotin deficiency, riboflavin, carotene and vitamin A, and fat transport and utilization. In conclusion, the author emphasizes the significance of the increasing number of reported interrelationships between the unsaturated acids and other essentials. "Undoubtedly the unsaturated acids function primarily as essential building stones in cell structures and in the mobile lipides. It would not be surprising to find numerous ill effects on domestic livestock and man of the present trend toward high carbohydrate diets containing small amounts of high saturated fats." A list of 92 references is appended.

The comparative rates of absorption of egg oil and cod liver oil, R. REDER. (Okla. Expt. Sta.). (*Poultry Sci.*, 21 (1942), No. 6, pp. 528-531, (1).)—The amount of oil absorbed from the gastrointestinal tract of fasted rats following the administration by stomach tube of approximately 1.5 cc. of egg oil (obtained by ether extraction of egg yolks) or cod-liver oil was determined by thorough washing out of the excised gastrointestinal tract and extraction of the fat from the washings with petroleum ether. The maximum amount of fat recoverable was determined by analysis of the contents of the gastrointestinal tract of rats sacrificed immediately after the administration of the oil, with correction for the mean amount of residual fat normally present in the gastrointestinal tract of rats at the end of a 48-hr. fast. The amount of fat recovered, i. e., not absorbed from the gastrointestinal tract, was determined after 2-, 4-, 6-, and 10-hr. absorption periods and calculated as percentage of the maximum amount recoverable; the difference represented the percentage absorbed. During the 2- and 4-hr. periods, the percentages of egg oil absorbed, 25.9 and 43.3, respectively, were slightly less than those of cod-liver oil, 30.7 and 48.7, respectively. Between the 4- and 6-hr. periods there occurred a lag in the absorption of cod-liver oil; at the end of 6 and 10 hr., respectively, only 58.8 and 87.2 percent of the cod-liver oil had been absorbed as compared with 69.6 and 97.7 percent, respectively, in the case of the egg oil. From these results it appeared that the egg oil was more readily absorbed than the cod-liver oil.

The structural specificity of choline and betaine in transmethylation, A. W. MOYER and V. DU VIGNEAUD. (Cornell Univ.). (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 373-382).—Earlier work indicated that the methyl groups of choline were biologically labile (*E. S. R.*, 87, p. 745). The present study to determine the relationship between the structure of choline and this behavior involved the testing of the methyl-donating ability of a systematically varied group of compounds structurally related to choline. The growth of young rats on the methionine-free homocystine-containing diet to which the compound in question was added was used as a criterion of this ability.

"Of the many compounds tested, only choline (and simple derivatives thereof such as lecithin and phosphorylcholine), betaine, and dimethylethylhydroxyethylammonium chloride were found to support growth under these conditions. The synthesis of α,α -dimethylcholine and of diethylmethyl- β,γ -dihydroxypropylammonium chloride has been described. The results of the present investigation are discussed with reference to the behavior of choline and related compounds in their ability to prevent development of fatty livers and hemorrhagic kidneys in the rat and to prevent perosis and act as a growth essential in the chick."

Effect of dietary choline, ethanolamine, serine, cystine, homocysteine, and guanidoacetic acid on the liver lipids of rats, D. STETEN, JR., and G. F. GIBIL (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 175-181).—"The quantity of liver lipide and its composition with respect to nitrogen, phosphorus, and choline have been investigated in rats on various levels of choline nutrition, and with addition to the diet of ethanolamine, serine, cystine, homocysteine, and guanidoacetic acid. The liver fat which results from dietary choline deficiency is poor in lecithin, whereas that which results from the feeding of cystine or homocysteine is abnormally rich in this phosphatide. Ethanolamine and serine, when fed, produce no great increase in liver lipide but bring about a rise in monoamino phosphatides of this organ. The feeding of guanidoacetic acid causes a marked fatty liver with a coincident striking decrease in the choline content of the liver lipide. A hypothesis is offered relating these latter findings to the well-known irreversible biological methylation of guanidoacetic acid."

Effect on growth and calcium assimilation of citric acid—potassium citrate mixtures, C. S. LANFORD (*Jour. Nutr.*, 23 (1942), No. 3, pp. 293-300).—These tests were designed to ascertain whether the earlier observed effect of orange juice in increasing the assimilation of calcium by rats on a wheat-milk diet (*E. S. R.*, 84, p. 275) was due to the citric acid and citrates contained. The animals were fed the same basal diet as in the previous experiment with orange juice, but a citric acid-potassium citrate supplement was fed in amounts to furnish about twice the amount of citric acid and citrates that had been provided by the 10 cc. of orange juice. Animals in the present tests showed increased growth rates and an increase in total calcium retention in comparison with response of the control animals, but, unlike the animals receiving orange juice in the earlier tests, failed to show any increase in the percentage of the dietary calcium retained in the body of the growing animal. "It thus appears that orange juice favors calcium assimilation in growth through some property in addition to its content of citric acid and citrates and its preponderance of base-forming elements."

Studies of liberal citrus intakes, I, C. S. LANFORD (*Jour. Nutr.*, 23 (1942), No. 4, pp. 409-416).—Twenty-five young adult subjects, 9 women and 16 men, participated in the experiment in which they each drank 1,800 cc. of freshly extracted grapefruit juice over a 10-hr. period, within which time their meals were kept low in citric acid. Total citric acid (free acid and salt forms) and pH were determined in the 24-hr. urine sample obtained in the period beginning with the fruit juice ingestion; similar determinations were made on the 24-hr. sample preceding the grapefruit juice ingestion, citric acid intake during that period including only that from the basal diet. The increase in citric acid excretion on the experimental day as compared with the control day was small, averaging about 2 percent of the "extra" citric acid ingested in the grapefruit juice, and indicating that the subjects utilized about 98 percent of the citric acid and citrates ingested in the very liberal intake of grapefruit juice. "Further evidences of a high tolerance toward citrus fruits were the absence of subjective symptoms and the finding in each case that consumption of grapefruit diminished the acidity of the 24-hr. urine sample." The pH of the urine was increased in all cases by the consumption of the grapefruit juice, the average increase being 0.06. Separate studies in which a large single dose of grapefruit juice was taken and urine collections were made at short intervals showed a similarly high percentage utilization of the citric acid and a rise in urinary pH at all times up to 22 hr. after ingestion of the juice.

Synthesis of inositol in mice, D. W. WOOLLEY (*Jour. Expt. Med.*, 75 (1942), No. 3, pp. 277-284).—Evidence is presented that mice are able to synthesize

inositol if pantothenic acid is present in the diet. Spontaneous cures of alopecia in mice have been traced to the presence in the intestinal tract of micro-organisms capable of synthesizing inositol. About 60 percent of the total inositol content of normal mice was found to be free.

Amino acids in hemoglobin formation, F. S. ROESCHT-ROBBINS (*Fed. Proc. [Fed. Amer. Soc. Expt. Biol.]*, 1 (1942), No. 2, pp. 219-224, figs. 2).—This address discusses the results of tests to determine the influence of individual amino acids on hemoglobin production in dogs made anemic due to loss of blood. When added at the optimum level of 1 gm. per day to the basal salmon-bread ration for a 2-week period, proline, threonine, glutamic acid, cystine, aspartic acid, histidine, glycine, and phenylalanine produced an average hemoglobin output of 34, 29, 25, 25, 25, 24, 23, and 23 gm., respectively, as compared with the average hemoglobin output of 100 gm. obtained with liver; nine other individual amino acids tested produced average responses varying from 10 to 20 gm. These results indicated that the dog had supplied other amino acids to supplement the specific ones given, and suggested that the amino acids may have accelerated the flow of other amino acids in the direction of globin construction. The addition to a basal nonprotein ration of 35 gm. of casein digest for a 2-week period produced in dogs depleted of plasma protein and hemoglobin increases of about 12 gm. of the former and 21 gm. of the latter. While the casein digest exerted only a moderate influence on plasma protein and hemoglobin production in these dogs, the digest was extremely effective in promoting abundant new plasma protein formation in a dog depleted of plasma protein alone. Enzymatic digests of hemoglobin administered intravenously in anemic dogs caused no hemoglobin production during the injection period (2 weeks), possibly due to toxic effect, but considerable hemoglobin and plasma protein were produced in the after-period. An amino acid mixture, theoretically furnishing all the nitrogenous essentials, was administered to a doubly depleted and nitrogen-starved dog. The amino acid mixture had no influence on either hemoglobin or plasma protein production, possibly because of utilization to satisfy more urgent needs or possibly because supplements which the body must contribute were not available in the severely depleted dog.

The toxicity of fluorine in dicalcium phosphate, F. DEEDS. (U. S. D. A.). (*Amer. Jour. Med. Sci.*, 203 (1942), No. 5, pp. 687-692).—Using the bleaching of rat incisor teeth as a criterion of injurious action, the fluorine present in dicalcium phosphate was shown to be as physiologically active as fluorine administered as sodium fluoride. The average daily dose of 1 teaspoonful of dicalcium phosphate containing 0.27 percent of fluorine represented a fluorine intake 10 times as great as the amount said to produce mottled enamel in at least some children.

Human milk technology, C. A. SMITH (*Jour. Ped.*, 20 (1942), No. 5, pp. 616-626, fig. 1).—This paper is concerned primarily with (1) methods of identification and tests for adulteration of human milk, (2) pasteurization and tests of pasteurization, (3) methods of preservation, and (4) the effect of some of these procedures on the food and vitamin values of the milk. The review is based on a rather scattered literature (32 references are cited) and on experience with certain procedures, including those for determining adulteration of human milk by the addition of cow's milk and those for preservation of milk. "In general, there is reason to conclude that the necessary process of pasteurization lowers the amount of vitamin C in human milk just as in cow's milk but does not otherwise alter its nutritional value, while the useful preservation process of slow freezing may also diminish the content of vitamin A. Whether this is sufficiently

depressed to require a vitamin A supplement (as well as one for vitamins C and D) might well be investigated."

Some new dietary essentials required by guinea pigs, D. W. WOOLLEY (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 679-684).—Two new factors, one soluble and one insoluble in 50 percent alcohol, were shown by the author, with the technical assistance of A. G. C. White, to be necessary for the survival and growth of young guinea pigs, and some evidence was obtained that a third factor is necessary for growth for longer periods than a few weeks. The first two factors have been concentrated, the second to a point at which 5 mg. per day produced good growth. Linseed oil meal was used in the concentration of the first of these factors, and dried grass and an alcohol-insoluble liver extract, as well as linseed oil meal, contained the second factor.

The biological action of the vitamins: A symposium, edited by E. A. EVANS, JR. (Chicago: Univ. Chicago Press; London: Cambridge Univ. Press, [1942], pp. IX+227, figs. 134).—This volume, bringing together the material on vitamins presented at the Chicago session of the Symposium on the Respiratory Enzymes and the Biological Action of Vitamins, September 1941, presents the following papers: The Biological Action of the Vitamins, by C. A. Elvehjem (pp. 1-16) (Univ. Wis.); Cocarboxylase, by S. Ochoa (pp. 17-42); Vitamin B₁₂—Clinical Aspects, by N. Jolliffe (pp. 43-53); Riboflavin, by P. György (pp. 54-72); Human Riboflavin Deficiency (Ariboflavinosis), by W. H. Sebrell (pp. 73-83); The Story of Pellagra and Its Treatment With Nicotinic Acid, by D. T. Smith (pp. 84-110); Pyridoxine, by S. Lepkovsky (pp. 111-119) (Univ. Calif.); Pantothenic Acid and the Microbiological Approach to the Study of Vitamins, by R. J. Williams (pp. 120-135); Pantothenic Acid in Human Nutrition, by E. S. Gordon (pp. 136-143) (Univ. Wis.); Biotin, by V. du Vigneaud (pp. 144-168); (Cornell Univ.); Choline, by W. H. Griffith (pp. 169-184); The Economy of Phosphorus in the Animal Organism, by F. C. McLean (pp. 185-201); Vitamin K, by D. W. MacVerquodale (pp. 202-210); and Vitamin K—Clinical Aspects, by H. P. Smith and E. D. Warner (pp. 211-227).

Occurrence of vitamins in fungi, C. C. CARPENTER and E. W. FRIEDLANDER (*Science*, 95 (1942), No. 2477, p. 625).—Riboflavin as well as thiamin was found to be produced by *Aspergillus niger* grown either in normal cultures or in those poisoned with mercuric salts or other poisons. Other species of the higher fungi also found to produce riboflavin and thiamin included the common market mushroom, *Agaricus campestris*; *Peziza badia*, a fleshy ascomycete; certain species of the *Glaucus* group of *Aspergillus*; certain species of *Penicillium*; and some of the *Fusaria*. It is considered probable that the production of thiamin and riboflavin is a normal function of the fungi.

The proper use of vitamins in mixtures, T. D. SPIES ET AL. (*Jour. Amer. Med. Assoc.*, 119 (1942), No. 12, pp. 948-949).—This report, authorized for publication by the Councils on Pharmacy and Chemistry and on Foods and Nutrition of the American Medical Association, summarizes the symptomatology of multiple vitamin deficiency and methods of therapy, discusses the reason for reconsideration of the earlier stand of the Council on Pharmacy and Chemistry against polyvalent vitamin mixtures (E. S. R., 74, p. 421), states the principles for the formulation of acceptable mixtures of vitamins for therapeutic purposes, and gives specifications for seven vitamin concentrates or mixtures which will be given consideration by the council. In each case the material must include the specific vitamins in proportions related to the minimum daily requirements as defined by the U. S. Food and Drug Administration.

Vitamin supplementation of U. S. Army rations in relation to fatigue and the ability to do muscular work, A. KEYS and A. F. HENSCHEL. (Univ. Minn.). (*Jour. Nutr.*, 23 (1942), No. 3, pp. 259-269).—This is a condensed report of an investigation under rigidly controlled conditions of the physiological and biochemical responses to standard severe exercise, on a motor-driven treadmill, in 26 soldiers during four experimental series tests in which the subjects consumed the regular garrison ration, with varying supplements of the water-soluble vitamins as follows: Series 1, thiamin 5, nicotinamide 100, and ascorbic acid 100 mg. daily; series 2, thiamin 7, nicotinamide 100, calcium pantothenate 20, riboflavin 10, pyridoxin 10, and ascorbic acid 200 mg.; series 3, same as series 2, with an additional 10 mg. of thiamin; and series 4, 100 mg. of pyridoxin alone. The supplements were administered over periods of from 4 to 6 weeks, alternating with placebo administration. The general findings and conclusions are summarized as follows:

"In neither brief extreme exercise nor in prolonged severe exercise and semi-starvation were there indications of any effects, favorable or otherwise, of the vitamin supplementation on muscular ability, endurance, resistance to fatigue, or recovery from exertion. Healthy young men expending an average of 3,700 to 4,200 calories per day are not benefited by a daily supply of more than 1.7 mg. thiamin chloride, 2.4 mg. riboflavin, and 70 mg. of ascorbic acid. It is concluded that no useful purpose would be served by enrichment of present U. S. Army garrison rations with the vitamins studied."

The chemical measurement and control of clinical vitamin deficiency, W. T. SALTER (*New England Jour. Med.*, 226 (1942), Nos. 16, pp. 649-656; 17, pp. 688-694).—Following general considerations relating to the use of chemical measurements for detecting vitamin deficiencies, methods selected by the author and his associates as offering the best compromise between the various factors discussed are reviewed, with references to the literature for vitamin A, thiamin, riboflavin, niacin, and ascorbic acid. In a final discussion of the extent of vitamin deficiency in this country, it is pointed out that, although a biochemical method cannot answer the question as to how impoverished in vitamins a person must be before he is considered unhealthy, it can at least measure the degree of vitamin lack. "Already there is considerable evidence that in Minot's 'twilight zone' of subclinical vitamin lack, human efficiency and effectiveness may be greatly impaired. In the impending strain on national resources this approach will assume particular importance."

The vitamins A and D potency of the oils obtained from the liver, intestines, body, and offal of shad (*Alosa sapidissima* Wilson) and mackerel (*Scomber scombrus* L.), L. I. PUGSLEY, J. T. KELLY, W. A. CRANDALL, and C. A. MORRELL (*Canad. Jour. Res.*, 20 (1942), No. 6, Sect. D, pp. 167-169).—Data were obtained on the percentage of liver and intestines in the fish and on the percentage of oil in body, liver, intestines, and offal. The iodine value and percentage of unsaponifiable matter and the potency in vitamins A and D were determined in the several oils. Considerable variation in the vitamin potency was found for the individual samples, but the values for mackerel-liver oil were within the limits of those usually reported for halibut-liver oil, and the shad-liver oil approximated the potency of cod-liver oil. The body oil of both fish was devoid of vitamin A as shown by the antimony trichloride test. The intestinal oils of mackerel were relatively high in vitamin A but low in vitamin D.

Comparison of vitamin A of liver biopsy specimens with plasma vitamin A in man, K. A. MEYER, H. POPPER, F. STEIGMANN, W. H. WALTERS, and S. ZEVIN (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 589-591, fig. 1).—A com-

parison of the vitamin A content of the blood plasma by the Josephs modification (E. S. R., 83, p. 564) of the Carr-Price method with that of liver biopsy material determined by the same method after preliminary hydrolysis is reported for 34 patients requiring operations for various abdominal diseases. No parallelism was found between plasma and liver values, except that the concentration of vitamin A in the liver was never low in subjects with plasma values above 80 International Units per 100 cc. Plasma levels of 50 I. U. per 100 cc. were found in subjects whose liver vitamin A ranged from 40 to 612 I. U. per gram. Likewise, plasma levels as low as 10 I. U. per 100 cc. were found in subjects with liver concentrations up to 160 I. U. per gram. Apparently the vitamin A level of the blood fluctuates more readily and is sooner depleted than the vitamin A stores of the liver. The vitamin A distribution in the liver was also examined by fluorescent microscopy (E. S. R., 84, p. 558) and was found to agree fairly well with the content as determined chemically.

The state of vitamin A in the liver of the rat. -II, The effect of feeding the vitamin over extended periods, E. L. GRAY and J. D. CAWLEY (*Jour. Nutr.*, 23 (1942), No. 3, pp. 301-307, figs. 3).—In this continuation of the investigation noted previously (E. S. R., 84, p. 701), three groups of from four to six rats each were placed at weaning on the Sherman B diet supplemented with vitamin A in the form of cottonseed oil dilutions of dogfish-liver oil, dogfish-liver oil concentrate, shark-liver oil, and shark-liver oil concentrate furnishing 100 U. S. P. units of vitamin A per drop. The dosage was started at 1 drop daily, gradually increased to 5 drops daily, and continued through 112 days, at the end of which time the animals were killed and their livers subjected to similar analysis for vitamin A as in the first part of the investigation, including a final separation by molecular distillation. In contrast with the earlier study in which the vitamin, following the short-time feeding of large doses, was found to be in combination with several fatty acids, in the present study it was found to be combined with only one fatty acid, possibly palmitic. When the vitamin was fed for only 60 days, it was found combined with more than one fatty acid but not in as complex an ester combination as when the system was completely flooded with the vitamin. These findings are thought to indicate that the rat has a definite limit as regards its normal capacity for taking care of vitamin A.

Vitamin A requirements in the rat. The relation of vitamin A intake to growth and to concentration of vitamin A in the blood plasma, liver, and retina, J. M. LEWIS, O. BODANSKY, K. G. FAULK, and G. McGUIRE (*Jour. Nutr.*, 23 (1942), No. 4, pp. 351-363, figs. 2).—This report embodies earlier data on the relation of vitamin A intake to blood levels and liver storage in the rat (E. S. R., 86, p. 562), with hitherto unpublished data on its relation to growth and the vitamin A concentration in the retina. Under the conditions of the experiment, daily feeding of 2 International Units of vitamin A represented the minimum for prevention of gross and histological evidence of vitamin A deficiency. On graded intakes of vitamin A, maximum growth occurred on 25 I. U., larger increases beyond this point resulting in no significant change. As vitamin A was not fed at levels between 10 and 25 I. U., the possibility is not excluded that some level between 10 and 25 I. U. might also have yielded maximum growth. Retinal concentrations of vitamin A reached their highest level at an intake of 2 I. U. daily. Combining these results with the earlier reported data for blood concentration and liver reserves, the requirement for optimal conditions with respect to various criteria in the young rat was in relative order—growth 25 I. U. daily, blood concentration 50, and good liver

reserves 100 I. U. daily. On a vitamin A-free diet, the plasma A concentration remained high in animals with large liver reserves and fell rapidly in those with low reserves, but the retinal concentration remained high even in the absence of the vitamin in the liver and its low concentration in the blood.

Attention is called to the similarity in these findings with earlier ones on infants in that the minimum requirement, as determined by dark adaptation, was found to be of the same order, 20 units per kilogram (E. S. R., 83, p. 849). For maximal blood concentration about 25 times as much vitamin A was found to be required as the minimum requirement for growth (E. S. R., 88, p. 282).

The fate of excess vitamin A stores during depletion: Value of the histologic demonstration of vitamin A, H. POPPER and S. BRENNER (*Jour. Nutr.*, 23 (1942), No. 5, pp. 431-443, pl. 1).—In this reinvestigation of the problem of vitamin A distribution and storage in the body, young rats given massive doses of vitamin A for nearly a month were examined periodically during a subsequent depletion period in groups of two males and two females each as follows:

The livers were examined for vitamin A histologically by the Popper method of fluorescent microscopy (E. S. R., 84, p. 558) and chemically by the method of McCoord and Luce-Clausen (E. S. R., 73, p. 274). The eyes were examined histologically and the pooled blood serums chemically.

The vitamin A fluorescence of the liver was found to run parallel with its vitamin A content at all levels, although the parallelism was more striking in the lower amounts. No simple parallelism appeared to exist between the vitamin A fluorescence of the liver and that of the retina or the vitamin A level of the blood. Under the opposite conditions of a superabundance of vitamin and advanced depletion, the Kupffer cells had a higher content of vitamin A than the liver cells, while in the intermediate stages representing probably the amount of A commonly found in adult stock animals (from 700 to 4,000 International Units), there was a homogeneous distribution of the vitamin A in the liver cells, with a fluorescence equal to or even greater than that of the Kupffer cells. It is thought that in hypervitaminosis the Kupffer cells store and then apparently destroy the excess of vitamin A, while in depletion the cells distribute the remnants of vitamin A. During depletion vitamin A was lost more rapidly from the livers of male than of female rats, but the histological picture showed no sex difference with respect to the method of utilization.

The relation of liver stores to the occurrence of early signs of vitamin A deficiency in the white rat, S. BRENNER, M. C. H. BROOKES, and L. J. ROBERTS (*Jour. Nutr.*, 23 (1942), No. 5, pp. 459-471, fig. 1).—In this phase of the general investigation, another phase of which is noted above, two series of tests were made. In the first, young rats were depleted of vitamin A from weaning and, in the second, after a preliminary period of administration of massive doses of the vitamin. The tests in both series included the appearance of early signs and symptoms of the deficiency in relation to the liver stores of vitamin A.

In the first series the small liver stores of vitamin A present at weaning were entirely lost by the end of the first week of depletion, but the blood and the eye tissues still contained appreciable amounts of the vitamin even after 7 weeks of depletion. Weight gains were slight, a microscopic examination of skin sections showed no abnormality, and macroscopic signs of vitamin A deficiency were mild. In the second series the liver storage at the beginning of the depletion period was high and showed no reduction during the first week of depletion. Thereafter the stores decreased rapidly until the eighth week, when the losses amounted to 93 percent. After this the loss was more gradual, the liver

still containing some of the vitamin at the thirtieth week of depletion. Blood levels of vitamin A decreased rapidly at first and then more gradually until a plateau was reached at about the thirtieth week. The vitamin A content of the retina decreased to the eighth week, when a plateau was reached. Even after the liver stores had been absent for several weeks, vitamin A was still present in the blood and the retinal tissues in amounts similar to that of stock rats at weaning age. Sex differences were found throughout. On equal intakes the males stored only two-thirds as much as the females per 100 gm., did not retain the vitamin as readily and had higher blood levels. These sex differences were found to be significant by Fisher's t-test.

Dark adaptation of children in relation to dietary levels of vitamin A, H. OLDHAM, L. J. ROBERTS, K. MACLENNAN, and F. W. SCHLUTZ (*Jour. Ped.*, 20 (1942), No. 6, pp. 740-752, figs. 3).—This further contribution to the question of the validity of the dark adaptation test and its reliability in diagnosing vitamin A subnutrition extends studies of Steininger and Roberts (*E. S. R.*, 83, p. 848) to the use of the Hecht adaptometer. "It reports the correlation of adaptometer readings and dietary studies, the effect of vitamin A supplements on dark adaptation, and a comparison of adaptometer readings of groups of children from different socioeconomic levels."

The mean rod thresholds of three groups of children from low, medium, and high socioeconomic levels known to have had widely different vitamin A intakes were almost identical, with approximately the same percentage of the subjects in each group showing subnormal dark adaptation. There was no correlation between adaptometer readings and daily vitamin A intakes. In tests of 50 matched pairs of children selected because of their low vitamin A intakes for comparison of the effect of the administration to one of each pair of 25,000 International Units of vitamin A each school day for a period of 9 weeks, a slightly larger number of children had vitamin A labile thresholds at the end of 2 weeks' supplementation than originally had thresholds in the subnormal zone, but, in general, the same children were classed as deficient by both methods. A slight but significant improvement was found in the mean rod plateaus of the children receiving the supplements than of paired controls, the effect being most pronounced in individuals whose original rod thresholds were in the subnormal zone. Significant improvement in rod thresholds was found in only 11 experimental as against 6 control subjects. "The above findings indicate either that the adaptometer does not measure the first signs of a vitamin A deficiency or that such a deficiency is uncommon among children in this area."

Vitamin B₁ in Indian foodstuffs (cereals, millets, and pulses), A. MADHAVA RAO, K. RAMACHANDRAN, and Y. V. S. RAO (*Cur. Sci. [India]*, 11 (1942), No. 4, p. 149).—The thiamin content, as determined by the rapid thiochrome method of Murty and Rao,³ is reported for a number of commonly used cereals, millets, and legumes purchased in Bangalore markets. The values obtained for cereals and millets checked well with similar values obtained by the Pyke method (*E. S. R.*, 85, p. 701). In the case of legumes, values by the latter procedure were appreciably higher than those obtained by the rapid method.

Vitamin B₁ and endurance, P. V. KARPOVICH and N. MILLMAN (*New England Jour. Med.*, 226 (1942), No. 22, pp. 881-882).—Time tests of college men for horizontal arm-holding and for breath-holding proved unreliable as a means of detecting vitamin B₁ deficiency.

³ *Cur. Sci. [India]*, 10 (1941), No. 3, pp. 180-182.

Further studies on the urinary excretion of thiamin in children, R. A. BENSON, L. B. SLOBODY, C. M. WITZBERGER, and L. LEWIS (*Jour. Ped.*, 20 (1942), No. 4, pp. 454-465).—The thiamin excretions of 75 children in acute, chronic, and convalescent stages of illness were studied in comparison with the previously reported study of 22 normal children (*E. S. R.*, 86, p. 868), and 55 of the children were also given test doses in an attempt to find a serviceable saturation test.

In the early convalescent stages of pneumonia the thiamin excretions of 12 subjects amounted to not more than 10 percent of the intake. In late convalescence 3 of 10 subjects excreted 20 percent and the others 15 percent or less of the intake. In 20 with rheumatic heart disease the inactive cases excreted over 20 and the active less than 20 percent, although a number of the latter group excreted more than 100 μ g. daily. Three children with common colds excreted more than 25 percent of the intake, while 5 with severe upper respiratory infections and 1 with acute bronchitis excreted 15 percent or less. In all other acute and early convalescent conditions the excretions amounted to less than 20 percent of the intake. Among the children with chronic conditions there were wide variations in outputs, both absolute and in percentage of intake. A low thiamin intake was the rule during the febrile phase of acute illness and a fairly low intake during early and late convalescence. Increased metabolism resulted in lowered thiamin excretion. Sulfathiazole treatment was found to have no significant effect.

Variable and inconsistent results were obtained in saturation tests given with both large and small test doses. The percentage of the dietary intake excreted was found to be a better indication of the degree of tissue saturation, with an average of 3 days preferred to a single determination. Thiamin supplements are recommended for children on an adequate diet (45 μ g. of thiamin per 100 calories) who habitually excrete less than 20 percent of their thiamin intake and (for short periods) for children convalescing from acute illnesses or suffering from chronic illness.

Induced thiamine (vitamin B₁) deficiency and the thiamine requirement of man: Further observations, R. D. WILLIAMS, H. L. MASON, B. F. SMITH, and R. M. WILDER (*Arch. Int. Med.*, 69 (1942), No. 5, pp. 721-738, figs. 2).—Essentially noted from a preliminary report (*E. S. R.*, 88, p. 138).

Why enriched bread? R. R. WILLIAMS and R. M. WILDER (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 4, pp. 225-229).—Wheat, it is pointed out, is the most important source of thiamin among foods consumed in amounts large enough to be significant in meeting the vitamin B₁ deficiency of the American diet. Due to popular resistance to whole-wheat bread, enrichment of white bread seems to be the logical way to introduce the needed thiamin into the diets of the greatest number of people. Statements by 21 leading teachers of medicine endorsing enriched white bread and flour are presented.

Fluorimetric assay of riboflavin in the urine and tissues of rats, M. SWAMINATHAN (*Indian Jour. Med. Res.*, 30 (1942), No. 1, pp. 45-52).—Balance experiments employing the methods noted on page 591 for the determination of riboflavin in urine and tissues were carried out for a period of 8 weeks on four groups of rats. The first two groups were fed a riboflavin-deficient basal diet supplying about 0.9 μ g. of riboflavin per rat per day, while the last two groups were fed a poor rice diet supplying about 2.2 μ g. of riboflavin daily per animal. In addition, each animal in one group on both the basal and the deficient diets received 50 μ g. of riboflavin daily mixed with the diet. In the groups fed the unsupplemented diet the daily excretion of riboflavin per rat was 1.9 to 2.6 μ g. respectively. The rats in both groups receiving the supplements excreted about

18 μ ., that is, about 45 percent of the ingested riboflavin. The riboflavin content of the liver, muscle, and heart of rats fed the unsupplemented diets was lower than that of the same tissues in rats receiving additional riboflavin and in stock animals.

Investigations on the stability of avidin, P. GYÖRGY, C. S. ROSE, and R. TOMARELLI (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 169-173).—The effect of various factors on the stability of avidin was studied. Solutions of purified avidin in concentrations of 1.0, 0.1, 0.01, and 0.001 mg. per cubic centimeter lost activity upon standing, the loss being more rapid in the dilute than in the concentrated solution. In any concentration the rate of destruction was much greater at 38° C. than at ice box temperature, and, except in the most concentrated solutions (0.1 and 1.0 mg. per cubic centimeter), even room temperature caused considerable acceleration of the rate. The loss of avidin activity in dilute egg white solutions was much less pronounced at these temperatures. Solutions of egg white or of purified avidin concentrate kept cooled under running water were irradiated with a 300-w. bulb at a distance of 12 cm. This irradiation inactivated the avidin in both solutions but more readily in solutions of the concentrates. In the latter, in very dilute solution (0.004 mg. per cubic centimeter), the irradiation even released the biotin bound to the avidin. The presence of riboflavin accelerated the action of the visible light. When solutions of egg white or of avidin concentrates were brought to pH 1.8 with HCl, their avidin activity was almost but not quite completely destroyed. Biotin already bound to the avidin was not released by the treatment with acid, nor was added biotin even when the avidin had been almost completely saturated with it.

Yeast-growth-promoting effect of diaminocarboxylic acid derived from biotin, V. DU VIGNEAUD, K. DITTMER, K. HOFMANN, and D. B. MELVILLE (*Soc. Expt. Biol. and Med. Proc.*, 50 (1942), No. 2, pp. 374-375).—The diaminocarboxylic acid resulting from hydrolysis of the urea ring of biotin by the action of strong $\text{Ba}(\text{OH})_2$ was found capable of stimulating the growth of yeast in a biotin-free medium. The compound possessed about 10 percent of the activity of biotin. Unlike biotin, it was not inhibited in its yeast-growth-promoting activity by the presence of purified avidin, thus suggesting that the urea ring is vital for the effect of avidin on biotin.

Observations on the "egg white injury" in man and its cure with a biotin concentrate, V. P. SYDENSTRICKER, S. A. SINGAL, A. P. BRIGGS, N. M. DEVAUGHN, and H. ISBELL (*Jour. Amer. Med. Assoc.*, 118 (1942), No. 14, pp. 1199-1200, fig. 1).—Three white men and one Negro woman in good condition and free from symptoms and signs of avitaminosis when the experiment began were maintained on a basal diet in which the vitamins of the B group were furnished in synthetic form and which contained desiccated egg white in amounts furnishing 30 percent of the total calories. The first signs of biotin deficiency appeared in all subjects during the third and fourth weeks in the form of a fine scaly, nonitching dermatitis, which disappeared spontaneously. The next indication of deficiency did not appear until the seventh week, when one of the subjects developed a maculosquamous dermatitis of the hands, arms, and legs. During this and the following week, all showed a grayish pallor of the skin, and the three white patients showed definite patches of atrophy of the lingual papillae. These did not develop in the Negro patient until the fourteenth week. During the ninth and tenth weeks the skin of the extremities was dry in all of the subjects and a dermatitis similar to that observed earlier developed in one case. After the fifth week, symptoms strikingly like those reported for thiamin deficiency appeared. Examination of the blood at intervals showed definite

decreases in hemoglobin, erythrocytes, and volume of packed red cells. The 24-hr. biotin excretion in the urine at the end of 7 and 8 weeks amounted to from 3.5 to 7.3 $\mu\text{g.}$ as compared with from 29 to 62 $\mu\text{g.}$ for subjects on a normal diet. These symptoms and signs were readily cured by the parenteral administration of a biotin concentrate. The doses administered varied from 75 to 300 $\mu\text{g.}$, with 150 $\mu\text{g.}$ proving to be the minimal amount required for prompt relief of symptoms.

The excretion of specific fluorescent substances in the urine in experimental nicotinic acid deficiency, V. A. NAJJAR, H. J. STEIN, L. E. HOLT, JR., and C. V. KABLER (*Jour. Clin. Invest.*, 21 (1942), No. 3, pp. 263-267, figs. 5).—Two fluorescent substances designated as F_1 and F_2 were noted in human urine. F_1 , with a whitish-blue fluorescence and maximum emission at 4,350 a. u., was present acute nicotinic acid deficiency was characterized by the disappearance of F_2 with greenish-blue fluorescence (upon the addition of alkali) and maximum emission at 4,550 a. u., was present in appreciable amounts in normal urine but absent in pellagra. To study the excretion of these fluorescent substances in pure nicotinic acid deficiency, uncomplicated with other deficiencies as in human cases, four dogs on a blacktongue diet were employed. In these, as in the human beings, acute nicotinic acid deficiency was characterized by the disappearance of F_2 excretion and a rise in F_1 excretion. As the disease became chronic (after about 20 days) the excretion of F_1 tended to fall. This trend also apparently occurred in human cases, since a much lower F_1 excretion was observed in very severe human pellagra than in certain moderately severe cases. When nicotinic acid was administered to the dogs, the excretion of F_2 increased while that of F_1 decreased. The reciprocal relationship between the F_1 and F_2 excretions was not a perfect one, however, for upon withdrawal of the nicotinic acid therapy the fall in F_2 excretion was not always accompanied by an equally prompt and impressive rise in F_1 ; nor was the magnitude of the rise in F_2 excretion always comparable to the degree of fall in the F_1 excretion.

Relationship between pantothenic acid requirement and age in the rat, K. UNNA and G. V. RICHARDS (*Jour. Nutr.*, 23 (1942), No. 6, pp. 545-553, figs. 2).—The pantothenic acid requirement of rats at different ages was determined by feeding tests on graded doses. In weanling rats consuming an average of 5.3 gm. of the diet daily, the daily requirement for maximum growth and the prevention of the characteristic changes in the fur was approximately from 80 to 100 $\mu\text{g.}$, while in rats 10 weeks or more of age, with an average food consumption of 15.5 gm. daily, the requirement was only 25 $\mu\text{g.}$ The time at which the sharp decline in requirements took place coincided with the period of decline in growth rate. In depleted rats a single curative dose was followed by a sustained gain in weight, with further doses producing a staircase effect. Attention is called to the striking difference between the response to thiamin and to pantothenic acid, the requirement of the former increasing and of the latter decreasing with age.

"The observation that the greatest need for pantothenic acid coincides with the period of maximal growth indicates that pantothenic acid may play a role in metabolism quite different from that of thiamin and other B vitamins connected with carbohydrate metabolism, and permits the speculation that it may be connected with metabolic processes involved in the formation of new tissue."

Occurrence in natural products of a physiologically active metabolite of pyridoxine, E. E. SNELL, B. M. GUIBARD, and R. J. WILLIAMS (*Jour. Biol. Chem.*, 148 (1942), No. 2, pp. 519-530).—A medium is described which, with the addition of pyridoxin, permitted luxuriant growth of *Streptococcus lactis* R but failed to support growth in the absence of pyridoxin or some tissue extract. This organism used with the basal medium in determining the pyridoxin content

of natural extracts gave values several hundred to several thousand times as great as could be accounted for on the basis of pyridoxin present. Preliminary fractionation experiments, not here described in full, showed the presence in these extracts of a substance responsible for the extra response. This substance, provisionally called pseudopyridoxin, was very similar to pyridoxin in its behavior toward adsorbents, eluting agents, acids, and bases, and in its migration in an electric field. Analyses of the tissues of normal and pyridoxin-deficient rats showed that the pseudopyridoxin content was greatly lowered in the latter tissues, while tissues of animals fed synthetic pyridoxin hydrochloride contained the pseudopyridoxin at levels often higher than those in normal animals. This distribution of pseudopyridoxin paralleled that of pyridoxin and frequently showed even greater differences in the same direction. The pseudopyridoxin content of the tissues paralleled the pyridoxin content of the ration and not the pseudopyridoxin content of the ration. The same was true for the concentrations in the urine as determined in excretion tests on rats. Following a test dose of pyridoxin, the excretion of pseudopyridoxin in human urine was greatly increased. "It is concluded that pyridoxin is converted by the animal organism to a metabolite of unknown nature which possesses much greater activity for *S. lactis* than does pyridoxin itself. This metabolite is generally distributed in natural products. The absorption of pyridoxin by *S. lactis* from media in which the pyridoxin concentration is the factor limiting growth does not occur to any appreciable extent in contrast to results secured with other vitamins under similar conditions. It is suggested that this result is the consequence of a necessary conversion of pyridoxin to pseudopyridoxin prior to utilization for growth by this organism."

Physiological activity of ascorbic acid in plant life, E. F. KOHMAN and D. R. PORTER (*Science*, 95 (1942), No. 2476, pp. 608-609).—Young tomato plants grown in pots and carefully washed free of soil contained from 46.3 to 62.8 mg. percent of ascorbic acid as analyzed in the evening. Comparable cut plants standing in water overnight gained in weight and contained from 22.5 to 47.7 mg. percent ascorbic acid, calculated back to the weight of the plants in the evening. These amounts of ascorbic acid in the cut plants were from 18 to 51 percent greater than the amounts in growing plants left standing overnight with water to cover the soil. These gained but little weight and contained from 18.2 to 31.5 mg. percent ascorbic acid. "The data indicate that the losses in ascorbic acid noted in vegetables and fruits in storage are not due entirely to oxidation by atmospheric oxygen, as is often stated, but due to its being used in some physiological process, the activity of which is diminished by severing the plant from the root system."

Factors in processing which affect the ascorbic acid content of fruit and vegetables, M. E. HUMMEL (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 9, pp. 273-275).—This review, based on 44 studies which are cited, considers (1) losses associated with storage, dehydration, freezing, cooking, canning, and fermentation, and (2) retention of artificially added vitamins in the cooking of vegetables.

Determination of vitamin C and its sampling variation in strawberries, L. BURKHART and R. A. LINEBERRY. (N. C. Expt. Sta. and U. S. D. A.). (*Food Res.*, 7 (1942), No. 4, pp. 332-337).—Because of the des' uction of ascorbic acid occurring in the long period required to grind strawberries to a fine pulp with sand, a motor-driven, emulsifying blender was used in the present study in which a 25-gm. sample placed in the container with 75 cc. of a mixture of 4 percent metaphosphoric acid and 8 percent acetic acid was ground to a very fine pulp in 1 min. The extract was centrifuged for 15 min. and titrated immediately

with an electrometric titrimeter according to the method of Kirk and Tressler (E. S. R., 82, p. 730). Using this improved method of extraction, a study was made of conditions affecting methods of sampling. Considerable variation was found in the ascorbic acid content of commercially packed strawberries, five samples drawn at random from a single quart showing a range from 35.9 to 44.8 mg. per 100 gm. of fruit. In checking possible causes of such variation, it was found that the ascorbic acid content of sun-ripened berries was greater than that of berries ripened in the shade, and that similarly sampled berries from different fields varied appreciably in ascorbic acid content. This effect of soil variation was observed in Klondike strawberries from six fields, two experimental and four commercial, all receiving the same fertilizer treatment, the ascorbic acid content of the berries by fields ranging from 36 to 52 mg. per 100 gm. Close agreement was found between duplicate quarts sampled under the same conditions as to location, time, degree of maturity, exposure to sunshine, and size of fruit. With this careful attention to sampling, varietal differences were studied with Fairmore, Missionary, Massey, and Blakemore varieties which averaged, respectively, 66, 46, 42, and 33 mg. of ascorbic acid per 100 gm. The outer portion of the strawberry (representing about two-thirds of the fruit) was found to have a higher concentration of ascorbic acid than the center portion, being about 20 percent richer in the Blakemore variety and 9 percent richer in the Fairmore. In the Klondike strawberries the ascorbic acid content increased from 59 mg. per 100 berries (244 gm.) in the case of green berries to 280 mg. per 100 berries (605 gm.) in the ripe fruit, this representing an increase in concentration from 24 to 46 mg. per 100 gm.

Vitamin C content of guavas, W. W. BOYES and D. J. R. DE VILLIERS (*Farming in So. Africa*, 17 (1942), No. 194, pp. 319-336, figs. 7).—Ascorbic acid was determined by 2,6-dichlorophenolindophenol titration of a metaphosphoric acid extract of a composite sample of South African guavas freed of pips prior to extraction. Average, maximum, and minimum values for ascorbic acid content and for percentages of outer and inner flesh and pips are presented for the 5 types set up; values for ascorbic acid, ranging for all groups from 172 to 671 mg. per gram, were lowest for the varieties with salmon-colored flesh and increased in order for varieties with white, orange, pink, and deep pink flesh. The ascorbic acid content was generally lower in early-season guavas than in later-season types and did not always seem to be greatly dependent on maturity. The skin and outer flesh were the richest in the vitamin. Very little ascorbic acid was lost in stewing the guavas, and the canned product proved to be remarkably stable under adverse conditions. A concentrated guava extract, however, lost its ascorbic acid very rapidly, and dried guavas and guava powders, at first rich in ascorbic acid, lost potency very rapidly in the warm climate.

Vitamin C in rose hips, M. PYKE and R. MELVILLE (*Biochem. Jour.*, 36 (1942), No. 3-4, pp. 336-339).—A survey has been made of the vitamin C content of the ripe hips of a number of British roses and some foreign roses grown in England. "A number of common species contain large amounts of vitamin C, often exceeding 1 percent, in the flesh of the ripe hips. The species indigenous to Scotland and northern England appear to contain higher concentrations of vitamin C than those roses commonly found in the more southern parts of this island."

Vitamin C in normal nutrition, D. F. MILAM and W. WILKINS (*South. Med. and Surg.*, 104 (1942), No. 4, pp. [3]).—Data are reported on fasting plasma ascorbic acid levels at biweekly intervals during 6 weeks of 15 children on a low-cost adequate diet in a summer camp in North Carolina. The values at the beginning ranged from 0.2 to 1.1, with a mean of 0.52 mg. per 100 cc.; after 2 weeks

from 0.4 to 1.4, with a mean of 0.96 mg.; and after 4 weeks from 0.9 to 1.9, with a mean of 1.34 mg. per 100 cc. Two children were not included in the test at the end of the sixth week. The value for another who developed otitis media after the fourth week dropped from 1.9 to 0.5 mg. per 100 cc. Aside from this subject no one had values less than 1 mg. per 100 cc., and the mean, including the low value for the one subject, was 1.23 mg. per 100 cc. It is emphasized that in the dietary at this summer camp for children only low-cost foods were used, and that calculated at regular retail prices charged by the local grocery stores the diet could have been duplicated in the home at a raw-food cost of 21.6 ct. per child per day.

Blood plasma ascorbic acid tests in mass studies in human nutrition, J. M. SMITH, M. L. PRESPER, and A. M. MCCORMICK (*Pennsylvania Sta. Bul.* 432 (1942), pp. [3]+55, figs. 35).—This bulletin covers two studies on the applicability of blood plasma ascorbic acid determinations by the Farmer and Abt micromethod (*E. S. R.*, 75, p. 588) to the evaluation of vitamin C status in mass studies in human nutrition and a comparison of the values obtained on 300 samples with the test as finally standardized with dietary intakes as secured from a 1-week record kept just before the test. The results obtained in the first two studies are indicated by the following recommendations.

"In making tests for vitamin C status on individuals in mass studies in human nutrition, it is recommended that each test be made between 3 and 3½ hr. after the last intake of food, as the last test in a half-day series of different nutritional tests on the same individual; that the samples be held in a refrigerator until a series of samples are taken from the different subjects participating in the mass studies during the half-day session; that no sample of blood plasma (nondeproteinized) be held longer than 30 min.; that analyses on deproteinized blood be completed within 2 hr. if possible; and that deproteinized serum never be held longer than 6 hr. before the analyses are completed."

In the comparison between plasma ascorbic acid and dietary intake of vitamin C, the coefficient of correlation (Pearson method) between one blood plasma ascorbic acid test and the corresponding dietary intake was 0.51 ± 0.03 , indicating a high statistical relationship.

Influence of hyperpyrexia on ascorbic acid concentration in the blood, S. L. OSBORNE and C. J. FARMER (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 575-578).—Blood plasma ascorbic acid determinations were made on 17 chronic arthritis patients immediately before, during, and after a combination fever-cabinet and inductotherm-heat treatment, with temperatures maintained at 104°-104.6° F. (rectal) for 4 hr. The average of 77 determinations at each of the four intervals ranged from 0.62 to 0.68 mg. percent, the differences being statistically insignificant. This is thought to afford evidence that high body temperatures per se do not significantly increase the rate of utilization of vitamin C.

The tocopherol (vitamin E) content of milling products from wheat, rye, and barley and the influence of bleaching, C. ENGEL (*Ztschr. Vitaminforsch.*, 12 (1942), No. 3, pp. 220-222; *Gr., Fr. abs.*, p. 222).—The samples were extracted with peroxide-free ether, the extract washed with alkali, acid, and water and evaporated in vacuo, and the residue taken up in benzene. This solution was filtered over Floridin XS-earth to remove carotenoids, and the tocopherol content of the filtrate was estimated with ferrichloride-dipyridyl. The tocopherol content of various milling fractions of wheat and rye, as milled in the Netherlands, was determined by this procedure. The content varied with the degree of milling, increasing with increasing degree of extraction. Bleaching of the flour

with benzoyl peroxide and nitrogen trichloride caused considerable loss of tocopherol.

Cure of repeated attacks of nutritional muscular dystrophy in the rabbit by alpha-tocopherol, C. G. MACKENZIE (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 3, pp. 313-317, fig. 1).—Repeated attacks of muscular dystrophy, as judged by creatinuria, loss of weight, reduced food consumption, and physical symptoms, were induced in young rabbits on a dystrophy-producing diet. As many as six successive attacks were produced and cured each time by the administration of α -tocopherol in amounts of from 5 to 15 mg. for the first three attacks and from 20 to 40 mg. for subsequent attacks. In contrast to animals permitted to succumb after the fourth or fifth attacks, the animals cured by from 2 to 4 weeks of treatment after the attacks showed, even after the sixth time, no hyalinization or necrosis or accumulations of cellular elements in the muscle tissue, and no testicular degeneration.

TEXTILES AND CLOTHING

[Textiles and clothing at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt.*, 1942, pp. 7-9).—This annual report covering the progress of work in the Textiles and Clothing Division (E. S. R., 86, p. 714) deals with clothes for women, cotton-stocking research, conservation of clothes and fabrics, and the use of substitute fibers.

A. S. T. M. standards on textile materials, H. J. BALL ET AL. (*Philadelphia: Amer. Soc. Testing Materials*, 1942, pp. XIII+408, figs. [76]).—This pamphlet, published annually (E. S. R., 87, p. 156) and prepared by the A. S. T. M. Committee D-13 on textile materials, contains definitions and terms, methods of testing, and specifications for textile and related materials developed by the American Society for Testing Materials. "Additional material appearing in appendices as information include photomicrographs of textile fibers, tables on basic properties of textile fibers, for yarn number conversion, and relative humidity; proposed recommended practice for designation of yarn construction, glossary of textile terms, proposed recommended practice for calculating number of tests, drafts of new test methods, an American war standard for specification and description of color, and abstracts of papers presented at meetings of Committee D-13." The textile materials covered include those made from cotton, wool, rayon, silk, asbestos, bast leaf, and glass fibers. The 43 standards and 29 tentative standards "cover not only methods of test for textile materials but also tolerances within which the textile must come in order that it shall constitute a good delivery on contract. In addition to these test methods and tolerances, the committee has more recently undertaken the writing of specifications of textile materials for specific uses. These were prepared in response to a number of requests and cover such materials as tire cord, chafer tire fabrics, ducks, electrical tapes, asbestos textiles, household fabrics, etc."

Determining the deterioration of cellulose caused by fungi: Improvements in methods, G. A. GREATHOUSE, D. E. KLEMME, and H. D. BARKER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 8, pp. 614-620, figs. 8).—The standardized quantitative method developed for the evaluation of the ability of fungi to decompose cellulose involved the use of replicate strips of the fabric incubated in individual chambers. These chambers were merely 16-oz. square bottles fitted with a modified cap in which glass cloth had been fitted to permit uniform aeration. Instead of solid mineral agar a liquid nutrient was employed, together with a width of glass fabric for the support of the test sample. A standard inoculum was introduced into the chamber and, after a

given incubation period, the average loss in breaking strength of the inoculated strips was determined and expressed as departure from the average of the controls. *McTarrhizium* sp. and *Chaetomium globosum* caused very rapid decomposition, were easily handled, and had other features that made them satisfactory test organisms. They were definitely superior to *C. elatum*, *Alternaria* sp., *Hormodendrum* sp., and *Stachybotrys papyrogena*. Ammonium nitrate was found to be a better source of nitrogen than sodium nitrate for the development of most of the fungi. The pH of the substrate appeared to have an important influence on the activity of cellulose-destroying fungi.

Latest developments in milkweed floss, L. STOUTER (Rayon Textile Mo., 23 (1942), No. 10, pp. 55-56, figs. 2).—With the importation of kapok from Java cut off by the war, the commercial possibilities of the milkweed have found realization in the establishment at Petosky, Mich., of a small factory, backed by war orders, for the production of milkweed floss. Here the milkweed pods, from the wild crop of 50,000 acres in northern Michigan, are dried under gas burners, which causes them to crack open, liberating the floss. This is run through a milkweed gin which separates the seeds from the floss fibers. The milkweed floss, which has six times the buoyancy of cork and is lighter and warmer than wool, is admirably adapted for packing life jackets and lining aviators' jackets and flying suits. The seeds, which have an oil content of 20 percent, may be crushed to obtain this oil, which is valuable as a semidrying oil in paints. It is pointed out that in large processing operations the seed pods would be of value for the latex and wax (5 percent each), which could be extracted, and for the yield of fiber excellent for paper making. In addition, it is noted that the stalk yields three different fibers satisfactory for making paper, rayon, explosives, wallboard, plastics, or strong textiles such as those made from jute.

The effect of resin finishes on the color fastness and physical properties of rayon gabardines, H. M. FLETCHER, W. M. HAY, and A. J. SURREATT. (Kans. State Col.). (Amer. Dyestuff Rptr., 31 (1942), No. 21, pp. 489-493, 514).—Viscose rayon gabardines, both resin- and non-resin-finished as determined by appropriate tests, were selected in light and dark shades of red, blue, green, and brown, for tests by procedures described, to determine the permanence of these finishes to dry cleaning and laundering and their effect on the colorfastness, breaking strength, elongation, and shrinkage. The resin-finished fabrics had a firmer handle than the non-resin-finished and had a better appearance after cleaning. Dry cleaning caused no loss in breaking strength, no change in elongation, and but little fading, and did not greatly affect the appearance in either group of fabrics. It did, however, cause shrinkage in both resin- and non-resin-treated fabrics, the former shrinking less than the latter by a highly significant amount. In the resin-finished fabrics there were no significant differences in the shrinkage for the dry cleanings and launderings, but for the non-resin-finished fabrics, the shrinkage due to laundering was significantly the greater. The shrinkage in the warp was significantly greater than in the filling for the resin-finished and highly significantly greater for the non-resin-finished.

Laundering caused greater fading than did dry cleaning, and the fading produced was significantly greater in the case of the non-resin-finished fabrics. Laundering decreased the breaking strength of the non-resin-finished but not the resin-finished fabrics, had no effect on elongation, and caused shrinkage of both fabrics, particularly those without finish, these becoming sleazy after laundering.

Statistical analysis of the data showed significant differences in the colorfastness and the physical properties favoring the resin-finished over the non-resin-finished fabrics. Thus the resin finish produced stronger gabardines as evidenced by increased wet breaking strength (but no increased resistance to abrasion) and

no decrease in breaking strength under the effect of light in the finished gabardines in contrast to the behavior of the non-resin-finished fabrics. Elongation and shrinkage and degree of color fading were also decreased by the resin finish.

Planning clothes for the farm family, D. DICKINS and A. BOWIE (*Miss. Farm Res.* [*Mississippi Sta.*], 5 (1942), No. 12, pp. 3-6, figs. 4).—This popular presentation of the findings of a clothing survey previously noted (*E. S. R.*, 88, p. 424) points out that clothing should be selected, not only for comfort and cleanliness but for appearance also, since clothing fulfills a social need. As a guide for planning clothing supplies and checking the wisdom of one's own clothing choices, information from the survey is given concerning the clothes which socially active white farm families had, the prices of such garments, and the frequency in cost of replacement. This material is offered for the guidance of Mississippi farm families on the thesis that having clothes like most other people who attend the same social events is essential to an adequate, satisfying clothing supply.

Make-overs from men's suits, C. L. SCOTT (*U. S. Dept. Agr. Leaflet* 230 (1942), pp. 8, figs. 5).—Suggested uses are discussed briefly and illustrated, and the pattern lay-outs are diagramed.

A B C's of mending, C. L. SCOTT (*U. S. Dept. Agr., Farmers' Bul.* 1925 (1942), pp. 16, figs. 15).—Pointers and directions concerning patching, darning, and mending are given.

HOME MANAGEMENT AND EQUIPMENT

[Economic studies at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt.*, 1942, pp. 2-3).—This progress report (*E. S. R.*, 86, p. 716) concerns the survey of changes in rural living—incomes, expenditures, and savings—conducted cooperatively by this bureau and the Bureau of Labor Statistics, U. S. Department of Labor; the material prepared for groups helping families to make living adjustments in the face of the economic impact of the war; the revised plans for adequate diets at low-, moderate-, and liberal-cost levels; and the work on food commodities in relation to agricultural production goals.

[Research in economics of the household and household management by the Cornell Station] (*N. Y. State Col. Home Econ., Cornell Univ., Ann. Rpt.*, 16 (1941), pp. 17-19).—Brief progress reports are given on studies by A. Aikin, under the direction of H. Canon and L. J. Williamson, on credit bureaus from the consumer's point of view; by E. K. Bennett, under the direction of E. M. Cushman and Canon with the assistance of M. Thompson, on the methods of maintaining felt-base floor coverings in home kitchens; by E. Knowles, under the direction of Canon and Cushman, on home-laundering tasks in relationship to the worker and the equipment; and by Williamson on the determination of practicable methods for the use of homemakers in selecting soaps and other water-softeners. A summary is also given of a completed study by M. Spicer, under the direction of Canon and Cushman, on major equipment, work space, and storage space with reference to common household tasks in 160 farm and village homes.

Summary of family classification, farm privilege, and cash cost of living, V. E. SCOTT and P. SWETT (*Farm Mangt. Bul.* [*Nevada Sta.*], 3 (1942), No. 4, pp. [1]+11+[12], figs. 3).—Data from 133 home account records, 64 obtained in 1940 and 69 in 1941, were summarized by size of income (low, under \$2,500; medium, \$2,501-\$5,000; high, over \$5,000) and size of family groups (under three, from three to five, and over five). The summaries indicated that in 1940-41 the general level of income (\$6,726 gross and \$5,598 cash) was higher than in 1939.

In 1939 the families were nearly equally divided among the three groups, while in 1940-41 nearly half were in the high group. In the higher income group more money was spent for home investments and the percentage of income used for this purpose was larger. Included under home investments were expenditures for new homes, furniture, home repairs, and new automobiles; the three latter items amounted to from 9 to 28 percent of the total cash expense. Total cash home expense averaged \$1,678 for all groups and included an average of \$1,273 for cash living; the balance, an average of \$405, for cash home investments represented nearly a fourth of the total cash home expense, and 6 percent of the average gross income. Total living expense included the cash expended for household and for personal items plus farm privilege, the latter consisting of the value of farm produce used in the home plus the rent value of the house, which was calculated at 10 percent of the beginning inventory value. Cash expenses averaged about 75 percent of the total expense (\$2,332), varying from 63 to 81 percent. Rent of dwelling constituted from 5 to 21 percent, and the value of the farm produce varied from 7 to 23 percent of the total cash expense. The values of cash living, rent, and farm produce used increased as income and size of family increased.

Food, personal expenses (including health, recreation, and development), and clothing accounted, respectively, for 31, 38, and 11 percent of the total cash family living expense. The latter increased as the size of the family increased, but expense per person was greater in the smaller sized families and was reduced as the family size increased. The value of home-produced foods increased as income increased, and within each income group increased as the size of the family increased. A high percentage of the family needs was produced on the farm.

[Factors affecting the expenditures for family living among Kansas farm families] (*Kansas Sta. Bien. Rpt. 1941-42, pp. 62-63*).—Progress is reported by M. A. Guinselmann and W. E. Grimes in the analysis of data from over 800 farm family account books.

[Household equipment and housing at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1942, pp. 9-10*).—This annual report (E. S. R., 86, p. 716) notes that work was directed toward (1) development of performance standards for new equipment built of substitute materials and for rebuilt equipment and (2) development of standard test procedures. Housing researches toward establishing minimum requirements for working and storage space in kitchens were carried forward.

MISCELLANEOUS

The farmers' handbook, edited by K. SYNNOTT (*Sydney, N. S. Wales: Dept. Agr., 1941, 5. ed., pp. VIII+1028, figs. [591], map. 1*).—A revision and enlargement of the book noted earlier (E. S. R., 37, p. 888).

University of Alaska Agricultural Experiment Stations, College, Alaska: Eighth Progress Report, 1938, 1939, 1940, 1941, L. T. OLDROYD (*Alaska Stas. Prog. Rpt. 1938-41, pp. 42, figs. 7*).⁴

Fifty-fourth Annual Report [of Georgia Station, 1942], H. P. STUCKEY (*Georgia Sta. Rpt. 1942, pp. 111, figs. 14*).⁴

Eleventh Biennial Report of the [Kansas Station, 1941-42], L. E. CALL ET AL. (*Kansas Sta. Bien. Rpt. 1941-42, pp. 79, figs. 2*).⁴

Value of agricultural research in wartime: Forty-eighth and Forty-ninth Annual Reports of the Montana Agricultural Experiment Station,

⁴ The experimental work reported is for the most part noted elsewhere in this issue.

[1941-42], R. T. CLARK ET AL. (*Montana Sta. [Bicn.] Rpt. 1941-42*, pp. 63, fig. 1).⁴

Oregon's agricultural research aids national defense: Biennial Report [of Oregon Station 1939-40], R. S. BESSE (*Oregon Sta. Bul. 401 (1941)*, pp. 92, figs. 41).⁴

Science for the farmer: Fifty-fifth Annual Report of the Pennsylvania Agricultural Experiment Station, [1942], [S. W. FLETCHER] (*Pennsylvania Sta. Bul. 429 (1942)*, pp. [4]+44, figs. 16).⁴

Report of the Puerto Rico Experiment Station, 1941 [A. LEE ET AL.] (*Puerto Rico Sta. Rpt. 1941*, pp. [2]+24).⁴

Bimonthly Bulletin, [November 1942] (*North Dakota Sta. Bimo. Bul., 5 (1942), No. 2*, pp. 50, figs. 7).—In addition to several articles noted elsewhere in this issue, this number contains *Herd Sires in Service on the Dairy Herds at N. D. A. C.*, by J. R. Dice (pp. 15-16); and *Publications of the Staff of the North Dakota Agricultural Experiment Station and of Cooperating Federal Agencies Assigned to the Station During the Station Year July 1, 1941, to June 30, 1942* (pp. 17-26) and *Searching for Farm Facts—Current Investigations of the North Dakota Agricultural Experiment Station* (pp. 33-49), both by H. L. Walster.

Farm and Home Science, [December 1942] (*Farm and Home Sci. [Utah Sta.], 3 (1942), No. 4*, pp. 12, figs. 17).—In addition to articles noted elsewhere in this issue this number contains *Dividends From Investment of Funds in Agricultural Research*, by R. H. Walker (pp. 2, 12); *Conservation of the Nutritive Values of Lamb and Tomatoes Studied at Station* (p. 2); and *Results of Station Research Have Practical Applications to War Emergency Agricultural Production Problems* (pp. 6-8, 10).

⁴ The experimental work reported is for the most part noted elsewhere in this issue.

NOTES

Arkansas University and Station.—Recent enrollments for military service include T. R. Hedges, professor of rural economics and sociology; W. R. Horsfall, assistant professor of entomology and assistant entomologist; Arthur H. Thompson, instructor in agricultural engineering; and Don A. Marshall, instructor and assistant in rural economics and sociology. Tildon Easley has been appointed instructor in agronomy, and Xzin McNeal, instructor in agricultural engineering.

Colorado College and Station.—As the process of cracking beet seed to increase the number of single plants results in approximately one-half usable seed and one-half discard, the station has been studying the discard as a possible livestock feed since there are about 1,000 tons of this material available each year in the State. Chemical analysis revealed 13 percent of protein. Seed of mallow, common sowthistle, alfalfa, and some viable beet seeds were found.

In a 120-day test of drenching for parasite control the experimental lambs brought \$15.75 per 100 lb., the day's top price for trucked-in lambs. One indication shown by the test is that two drenchings will prevent condemnation of livers due to fringed tapeworm infestation.

H. S. Wilgus, Jr., head of the poultry section, has accepted a captaincy in the food and nutrition division of the Sanitary Corps, U. S. Army. W. E. Connel, area conservationist in the U. S. D. A. Soil Conservation Service, has been appointed to take charge of research in feeding beef cattle, dairy cattle, sheep and lambs, and hogs.

Kansas College and Station.—The Kansas Industrial Commission has allotted \$25,000 for additional research on dehydration of farm products. A laboratory will be set up at the college under the direction of the department of chemistry.

The resignations are noted of C. K. Ward, associate professor of economics and sociology; Dr. J. A. Weybrew, assistant chemist; and J. W. Mather, extension assistant professor of agricultural economics (marketing). The last named has been succeeded by Dwight S. Tolle. Leave of absence to enter military service has been granted C. J. Birkeland, research assistant in horticulture; James W. Martin, assistant professor in agricultural engineering; and Dr. C. H. Whitnah, assistant professor in chemistry and dairy chemist. Thomas Thomson, instructor in the department of chemistry in the School of Arts and Sciences, has been transferred to the station staff as assistant chemist to take over the industrial research formerly assigned to Henry S. C. Lau, resigned.

Minnesota Station.—Two new apple varieties developed by the station have been announced as ready for general release. Victory, or Minnesota 396, is much like McIntosh in quality and aroma, but is more resistant to scab, hangs better on the tree, and packs and keeps more satisfactorily, while the tree is more winter-hardy in Minnesota. A second variety, named Fireside, or Minnesota 993, is of the Delicious type, large, roundish-conic in shape, medium red in color, and approaches the ideal of a winter keeper.

Dr. L. S. Palmer, professor of agricultural biochemistry, has been appointed chief of the division of agricultural biochemistry. Dr. J. W. Nelson, research fellow in biochemistry, has become research chemist in nutrition for Cargill, Inc., and has been succeeded by Dr. Floyd C. Olson, formerly assistant chemist in the West Virginia Station.

Mississippi Station.—Dr. H. H. Foster, plant pathologist of the Tobacco Institute of Puerto Rico, has been appointed plant pathologist of the Truck Crops Branch Station, replacing Dr. F. J. LeBeau, resigned to accept a position in Mexico with the U. S. D. A. Bureau of Plant Industry, Soils, and Agricultural Engineering, in its rubber investigations. Mr. Foster will also serve as acting superintendent, pending the return of John A. Campbell, who is now with the armed services. H. A. York, in charge of cotton and soybean work at the Delta Branch Station, has been appointed superintendent of the Raymond Branch Station. Dr. C. H. Ragland, professor of horticulture, has reported to the U. S. Army as a reserve officer. George V. Young, assistant plant pathologist of the U. S. Department of Agriculture, has been transferred to the department of plant pathology at State College, where he will undertake studies in corn diseases.

Washington Station.—Dr. Earl J. Anderson, associate pathologist in the Hawaiian Pineapple Growers Association, has been appointed head of the division of plant pathology. Clarence Lounsbury, assistant in the U. S. D. A. Soil Survey, has been appointed soil surveyor vice R. H. Fowler, who is on leave for military service.

West Virginia University and Station.—Hazel Cameron, research associate in nutrition, has resigned to accept a position in the State Department of Public Health. Staff members on leave for military service include Lowell Besley, associate forester; R. H. Black, assistant in animal husbandry; W. M. Broadfoot, assistant in agronomy; J. B. Byers, assistant in forestry; Torkel Holsoe, assistant forester; L. J. Manus, assistant in dairy husbandry; A. S. Margolin, photographic assistant; J. F. McMurray, assistant in wildlife management; O. M. Neal, Jr., assistant in horticulture; and T. D. Runnels, assistant in poultry husbandry. W. W. Armentrout, agricultural economist, is on leave as area rent director, Office of Price Administration, for Monongalia and Marion Counties.

Nutrition Foundation.—Grants for the coming year of \$148,550 have recently been announced, including \$110,700 for the renewal of 28 projects supported during 1942 and \$37,850 for 15 new projects. Among the institutions receiving new grants are the University of Wisconsin, the University of California, the Massachusetts State College, Cornell University, the Oregon State College, and the Oklahoma Experiment Station.

Cooperative Experiment Stations in Latin America.—Recent personnel announcements in *USDA* for the cooperative experiment stations established in Nicaragua, Ecuador, and Peru include the following: Nicaragua (Recreo), Robert L. Pendleton, director; P. L. Guest, horticulturist; Arthur G. Kevorkian of the Puerto Rico Federal Station, pathologist; and S. H. Work, animal husbandman. Ecuador (Quevedo), Lee Hines, director, assisted by Lewis E. Long and Lewis H. McCann. Peru (Tingo María), Benjamin J. Birdsall, director; Rolland C. Lorenz, pathologist; and Harold J. Brooks, animal husbandman; and William L. Wickline, extension specialist.

The Peruvian station at Tingo María is located on a tract of about 13 acres on the Huallaga River on the eastern slope of the Andes and will be devoted to encouraging the large-scale production of rubber, quinine, and other products formerly obtained from the Far East. The plant will consist of 3 main buildings and 20 residences, costing in excess of \$160,000. The principal buildings will comprise a head house plant with the main laboratories and greenhouses, an administration building with offices and a library, and a dormitory or club house for single men.

EXPERIMENT STATION RECORD

VOL. 88

JUNE 1943

No. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Bureau of Agricultural Chemistry and Engineering] (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt., 1942, pp. 2-36*).—The principal subjects on which data are reported are agricultural chemical investigations, including new applications of the brining process, preparing fruits for overseas shipment, alcohol from citrus-waste liquors, new fruit products and byproducts, cereals and seed products, eggs and poultry meat for export, more sugar from domestic sources, coffee-sugar tablets for the army, sorgo sirup as a source of alcohol, byproducts from sorgo and sugarcane, sweetpotato vines and tubers for feed, feeding value of hemicelluloses, vegetable oils, how grain storage affects proteins, improving the protein value of foods, prevention of bin burning in grain, and control of enzymes to conserve foods; special research in agriculture, including research on fast-drying oil from soybeans and plastics from soybean meal; regional research laboratories, including work on synthetic rubber, the rubber substitute Norepol, starches from waxy corn and sorghum, plastics from agricultural residues, cork substitutes from residues, penicillin, a new antiseptic agent from corn sugar, lint cotton for smokeless powder, replacing imported fibers with cotton, processing cotton for military uses, novel defense uses for cotton, recovery of seed oils from press cake, replacing imported oils with modified domestic oils, expanding uses of oilseed meals, starch and carotene from sweetpotatoes, processing fruits for food, emergency uses for apples, industrial products from fruit wastes, using plant pigments of alfalfa, packing poultry products by freezing, preserving eggs without refrigeration, utilizing poultry wastes, preserving vegetables by freezing, utilizing vegetable wastes, nicotine and nicotinic acid from tobacco, industrial products from milk proteins, intermediates for synthetic resins and rubber from lactic acid, preventing rancidity in animal fats, uses for potato starch and derivatives, developing domestic tanning materials and chrome-saving tannages, and conserving domestic hides and skins; and naval stores investigations, including those on potential synthetic-rubber intermediates and other products from turpentine, separating turpentine into components, getting stable resins from pine gum, rosin products to replace scarce ones, military uses for naval stores, and wartime changes in making, handling, and storing naval stores.

Flocculation and electrokinetic behavior of two deferrated soil colloids, S. J. TORR. (*N. J. Expt. Stas.*). (*Soil Sci., 53 (1942), No. 4, pp. 265-272*).—The removal of Fe and Al from soil colloids by the free iron oxide method and

by electrodialysis produced colloidal residues, the chemical and electrokinetic properties of which differed widely from those of the untreated colloids.

The concentration of HCl required for flocculation of deferrated Na-colloids was not markedly different from that required for flocculation of the untreated Na-colloids, but the cataphoretic charge associated with the deferrated colloids was generally higher than that of the untreated colloid. The concentration of H_2SO_4 required for flocculation was approximately the same for the untreated colloid as for the deferrated residue, but the concentration required for flocculation increased with further deferration. The most marked effects from deferration were noted in the H_2PO_4 system, and particularly in the more fully deferrated residues of this series, the flocculating concentration of acid increasing from 1.5 to 2.0 milliequivalents per liter with the more fully deferrated residues of the Colts Neck colloid and from 1.0 to 2.0 m. e. with the more fully deferrated residues of the Penn colloid. Deferration lowered the isoelectric pH of the colloids, and these lowerings were correlated with decreased ultimate pH values in water and in N KCl . The differences in electrokinetic behavior and flocculation between the deferrated and the untreated colloids are explained on the basis of basoid removal during deferration and electrodialysis.

The formation of cysteine from homocysteine and serine by liver tissue of rats, F. BINKLEY and V. DU VIGNEAUD (*Jour. Biol. Chem.*, 144 (1942), No. 2, pp. 507-511).—The conversion of a mixture of homocysteine and serine to cysteine by liver tissue of rats has been demonstrated. In the absence of serine only slight cysteine formation was observed. Homocysteine was found far more effectively converted than was methionine. The possible significance of these findings in conjunction with the biological behavior of the unsymmetrical thio ether, $\text{H-S-(}\beta\text{-amino-}\beta\text{-carboxyethyl)homocysteine}$ (cystathionine), is discussed.

The formation of cysteine from $\text{H-S-(}\beta\text{-amino-}\beta\text{-carboxyethyl)homocysteine}$ by liver tissue, F. BINKLEY, W. P. ANSLOW, JR., and V. DU VIGNEAUD. (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 559-560).—The formation, in an experiment carried out in vitro, of 7.8 mg. of cystine from 50 mg. of the homocysteine derivative was indicated by a colorimetric method; and after precipitation of the cystine as the cuprous mercaptide and removal of the copper, 6 mg. of cystine was found by the Sullivan method.

The critical peptization temperatures of zein in concentrated ethyl alcohol, R. H. MANLEY and C. D. EVANS. (U. S. D. A.). (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 701-702, fig. 1).—Working under the rigid exclusion of moisture, the authors demonstrated that zein is dispersible in concentrated aqueous alcohol as well as in absolute alcohol at temperatures above the normal boiling point of the solvent. The curve accompanying the paper shows critical temperatures ranging from about 120°C . in absolute alcohol to a minimum between 0° and -10° for alcohol concentrations between 70 and 80 percent. From 70 percent down to 40 percent of alcohol the critical temperature is shown as rising again to a temperature between 50° and 60° at the 40-percent alcohol concentration.

Isolation of mesolanthionine from various alkali-treated proteins, M. J. HORN, D. B. JONES, and S. J. RINGEL. (U. S. D. A.). (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 87-91).—Lanthionine (E. S. R., 87, p. 166), has now been isolated (1 percent) from acid hydrolyzates of hair pretreated by being boiled for 1 hr. with 0.1 N NaOH solution. Dilute alkali reacts with wool even at relatively low temperatures. Lanthionine (0.1 gm.) also was isolated from 100 gm. of wool that had been suspended in 2-percent solution of Na_2S for 6 days at 37°C . In addition there was obtained about an equal amount of

another compound having properties similar to lanthionine but more soluble and differing in crystal form.

Isolation of *dl*-lanthionine from various alkali-treated proteins, M. J. HORN, D. B. JONES, and S. J. RINGEL. (U. S. D. A.). (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 93-97, figs. 2).—An isomeric thio ether amino acid, previously observed accompanying mesolanthionine in approximately the same proportion in the hydrolyzates of certain alkali-treated proteins, has been isolated from Na_2CO_3 -treated human hair. Because it is optically inactive, but differs from mesolanthionine in solubility and crystalline form, and because it agrees closely in its properties and crystalline form with those given for the synthetic *dl*-lanthionine, this compound seems definitely identifiable as *dl*-lanthionine. Although sparingly soluble in water, it is approximately seven times as soluble as mesolanthionine. It possesses the property of dimorphism and crystallizes from dilute ammonia as lustrous, elongated hexagonal plates, decomposing at $283^\circ\text{--}284^\circ$ [C.], but separates from water as crystals belonging to a different crystal system and having several different crystal habits.

Carbohydrate characterization.—III, The identification of hexuronic or saccharic acids as benzimidazole derivatives, R. LOHMAR, R. J. DIMLER, S. MOORE, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 551-556).—The method of two of the present authors for characterizing certain aldomonosaccharides by oxidizing with an alkaline hypiodite to the corresponding aldonic acid and condensing the acid with *o*-phenylenediamine (E. S. R., 86, p. 435) has been extended to cover hexuronic acids. These are similarly oxidized to the corresponding saccharic acids, and these dibasic acids are condensed with 2 molecular equivalents of the diamine to form dibenzimidazoles. The method as here described was specifically adapted for the identification of the naturally occurring hexuronic acids, *d*-glucuronic, *d*-mannuronic, and *d*-galacturonic, as dibenzimidazole derivatives of the corresponding saccharic acids. The applicability of the procedure was tested on hexuronic acids, glycuronides, and polyuronides.

The characterization of lactic acid as the benzimidazole derivative, R. J. DIMLER and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 557-558).—The racemic 2-(α -hydroxyethyl)-benzimidazole formed from lactic acid and *o*-phenylenediamine was found to have the melting point $179^\circ\text{--}181^\circ$ C., its hydrochloride to melt at $211^\circ\text{--}213^\circ$, and its silver salt to be a form in which the compound may be almost completely isolated. The isolation of the compound as its silver salt was found an especially convenient method of preparing it.

The dissociation constants of hydroxylysine, F. W. KLEMPERER, A. B. HASTINGS, and D. D. VAN SLYKE (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 433-437, figs. 2).—The dissociation constants of hydroxylysine were determined at 38° [C.] as $\text{pK}'_1=2.13$, $\text{pK}'_2=8.62$, and $\text{pK}'_3=9.67$ as compared with those of lysine, $\text{pK}'_1=2.20$, $\text{pK}'_2=8.90$, and $\text{pK}'_3=10.28$. These data confirm the view that the hydroxy group is attached in the δ or ϵ position to the carbon atom adjacent to that carrying the amino group.

Prolactin, A. WHITE, R. W. BONSNES, and C. N. H. LONG (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 447-464, figs. 5).—From a highly purified amorphous preparation of beef prolactin it was shown to be possible to prepare a crystalline protein with a lactogenic activity very similar to that of the amorphous product. The homogeneity of this protein was indicated by studies of its electrophoresis, ultracentrifugation, and solubility measurements. The sedimentation constant, diffusion constant, approximate molecular weight, isoelectric point, elementary analysis, tyrosine, tryptophan, and cystine content, heat stability at various pH

values, and the alterations in biological activity occurring when the protein was hydrolyzed with acid, pepsin, or trypsin were also determined. The data obtained confirm the supposition of the protein nature of this hormone.

Adipic acid as an oxidation product of the diaminocarboxylic acid derived from biotin. K. HOFMANN, D. B. MELVILLE, and V. DU VIGNEAUD (*Jour. Biol. Chem.*, 144 (1942), No. 2, pp. 513-518).—Oxidation of the diaminocarboxylic acid derived from biotin, either with nitric acid or with permanganate, yielded adipic acid as one of the oxidation products. That one of the carboxyl groups of the adipic acid is the original carboxyl group in the biotin molecule is indicated by the nonappearance of adipic acid among the oxidation products of the amine formed by a Curtius rearrangement of biotin hydrazide.

The in vitro formation of thyroxine and diiodotyrosine by thyroid tissue. M. E. MORTON and I. L. CHAIKOFF (*Jour. Biol. Chem.*, 144 (1942), No. 2, p. 565).— I^{131} was added as iodide. At the end of 3 hr., the distribution of I^{131} among iodide, diiodotyrosine, and thyroxine in the tissue plus its surrounding medium was 1:6:1. In 3 hr. as much as 12 percent of the I^{131} added to the bath was found as thyroxine and as much as 70 percent as diiodotyrosine.

Gluconic acid production: Repeated recovery and re-use of submerged *Aspergillus niger* by filtration. N. FORGES, T. F. CLARK, and S. I. ARONOVSKY. (U. S. D. A. coop. Iowa State Col.). (*Indus. and Engin. Chem.*, 33 (1941), No. 8, pp. 1065-1067, figs. 2).—In the semicontinuous method of producing gluconic acid from glucose by *A. niger*, the mycelia were recovered by pressure filtration and reused in nine successive fermentations of media containing 16 gm. of glucose per 100 cc. In the fermentation of a solution containing 16 gm. of glucose and about 2.6 gm. of calcium carbonate per 100 cc., the uncombined gluconic acid is present in sufficient concentration to prevent the formation of calcium gluconate crystals which tend to mat with the mycelial growth and thus hinder filtration. This filtration permits the utilization of a full charge of fresh medium of higher glucose concentration than was feasible with the flotation method. In the cases where the free acid concentration was low, centrifugal filtration was the more efficient method of removing the mycelia from the fermented liquor.

Glutamine and glutamic acid as growth factors for lactic acid bacteria. M. A. POLLACK and M. LINDNER (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 655-661).—Acid-producing bacteria comprising 6 strains of *Streptococcus lactis* and cultures of *Lactobacillus pentosus*, *L. arabinosus*, and *L. Casei* were shown to require either glutamine or glutamic acid for growth. Of these organisms, 5 responded as well to glutamic acid as to glutamine, but the other 4 required at least 11 times as much acid as amide to produce the same effect.

It is held unlikely that glutamic acid functions through the amide, because both forms are equally potent on an ammonia-free medium in some cases and the addition of a high concentration of ammonium chloride produces only a minor increase in the effectiveness of glutamic acid. None of the bacteria tested could produce glutamine from glucose and ammonium salts. The mechanism believed to be most likely is that the bacteria require glutamine or glutamic acid simply for the construction of cell proteins, particularly in view of the fact that the requirements of these amino acids are of the order of magnitude which would be expected for this use.

Distribution of isotopic nitrogen in *Azotobacter vinelandii*. R. H. BUREIS (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 509-517, fig. 1).—*A. vinelandii* cells supplied with molecular N^{15} for 90 min. after an initial period of 18 hours' growth in normal nitrogen were fractionated to determine the distribution of total nitrogen and isotopic nitrogen. Arginine and histidine were present in large quantities but carried low levels of N^{15} . "Amide" nitrogen and three

copper salt fractions of the monoamino acids gave intermediate values for the N^{15} isotope, whereas the lysine fraction was somewhat higher in N^{15} . Among the amino acids, glutamic acid and the aspartic acid fraction showed the highest levels of N^{15} . The Neuberg filtrate was high and the extracellular nitrogen of the culture was low in isotope concentration.

The data are discussed in relation to proposed mechanisms of biological nitrogen fixation.

An enzymatic conversion of radioactive sulfide sulfur to cysteine sulfur, C. V. SMYTHE and D. HALLIDAY (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 237-242, fig. 1).—Cysteine and hydrogen sulfide containing radioactive sulfur have been added to an enzyme preparation which converts cysteine to pyruvic acid, ammonia, and hydrogen sulfide. When the nitrogen of part of the added cysteine had been converted to ammonia, the reaction was stopped and the remaining cysteine was isolated. It contained appreciable amounts of radioactive sulfur, thus demonstrating the formation of cysteine sulfur from sulfide sulfur under these conditions.

Oxidation, reduction, and sulfhydryl in autolysis, B. BAILEY, S. BELFER, H. EDER, and H. C. BRADLEY. (Univ. Wis.). (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 721-728, figs. 3).—The authors obtained results suggesting the presence of two enzymes concerned in the primary cleavage of the tissue proteins. One of these is active whether cysteine is present or not, and in the absence of the activator autolysis goes on slowly to reach a cleavage level determined by the active masses of substrate and products. The second enzyme requires sulfhydryl activation. When this is provided, digestion is much more rapid but the same final degree of cleavage is attained. The effect of cysteine is to produce more active proteinase in the mixture rather than more available protein.

Conversion of estrone to estriol in vivo, W. H. PEARLMAN and G. PINCUS (*Jour. Biol. Chem.*, 144 (1942), No. 2, pp. 569-570).—A total of 1.05 gm. of oestrone acetate, m. p. 124°-125° [C.], was dissolved in oil and injected intramuscularly into healthy young men. The pooled urines (30.7 l.) subsequently collected were extracted with ether after acid hydrolysis. The phenols were taken up in benzene and extracted with 0.3 M sodium carbonate in order to obtain the oestriol fraction and the procedure repeated. Further purification of this fraction (approximately 30,000 r-units) gave 10.3 mg. of semicrystalline material, which yielded from ethyl acetate 1.6 mg. of crystals, m. p. 266°-268°. Recrystallization from the same solvent gave 0.6 mg., m. p. 269°-270°; a mixed melting point determination with authentic oestriol, m. p. 271°-273°, gave 268°-272°. The oestrogenic potencies of both preparations were identical; both gave an identical color reaction spectrum. An additional 2 mg., m. p. 268°-270°, were obtained from the mother liquors.

A green pigment-producing compound in urine of pyridoxine-deficient rats, S. LEPKOVSKY and E. NIELSEN. (Univ. Calif.). (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 135-138, figs. 2).—Pyridoxine-deficient rats were found to excrete an unidentified compound convertible to a green pigment by ferric ammonium sulfate. The pigment acted as an indicator to acids and bases, turning a light yellow in strongly acid solution and yellow in strongly basic solution. Administration of pyridoxine to the deficient rats stopped the excretion of the precursor of the green pigment in a few hours. Some of the properties of the green pigment are discussed.

Non-hemin and total iron in bull spermatozoa, C. A. ZITTLE and B. ZITIN (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 105-112).—The total iron content of dried lipide-free bull spermatozoa was determined colorimetrically, with the thiocyanate, thioglycolic acid, and o-phenanthroline reagents, to have a mean

value of 0.0071 percent. The iron content of parts of the spermatozoa prepared from spermatozoa broken by sonic vibrations and homogenization was also determined, but the accuracy was considered to be impaired by contamination from the apparatus used. Definitely more iron was present in the midpieces and tails of the spermatozoa than in the heads, however. Cytochrome *c* could not be detected spectroscopically.

The nonhemin iron of bull spermatozoa was estimated to be 60 percent of the total iron. Similar determinations on bull testicles were made. Experiments showing that the method used, extraction with hot pyrophosphate, was not limited by the formation of an insoluble iron-pyrophosphate compound are also recorded.

The amount and distribution of cytochrome oxidase in bull spermatozoa, C. A. ZITTLE and B. ZITIN (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 99-104).—The molecular oxygen consumed by spermatozoa, disintegrated by grinding or by sonic treatment, with *p*-phenylenediamine as the substrate in the presence of excess cytochrome *c* at 37° [C.], was used as a measure of cytochrome oxidase. An average O₂ consumption of 25 mm.³ per milligram per hour was found with sonically treated spermatozoa. The O₂ consumption by the parts of the spermatozoa in the same test system was heads 1.2, midpieces 14.4, and tails 29.1 mm.³ per milligram per hour. These differences are discussed in relation to the function of the different parts. In similar experiments with sodium succinate as the substrate, the results were of the same magnitude as those with *p*-phenylenediamine. With hydroquinone as the substrate the O₂ consumption was smaller, particularly so with the ground spermatozoa, with which it was negligible. Measurements made at 20° showed a similar variation with the different substrates. Some O₂ was taken up by the preparations of spermatozoa (5.1 mm.³ per milligram per hour with sonically treated spermatozoa) with *p*-phenylenediamine when no cytochrome *c* was added.

Enzymes of the fig, A. WOOD. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 21 (1942), No. 10, pp. 308-310, 317).—This article is a compilation of the observations of a number of investigators. Topics dealt with are the proteolytic enzyme of the fig, its activation, and the proteinase substances which have been found to be attacked by it; ficin and the crystalline enzyme of the fig; seasonal variation in proteolytic activity; optimum pH value; inactivation temperature; etc. Of oxidizing enzymes the peroxidase and the catalase are discussed. One reference to the presence of amylase in the latex of *Ficus carica* is cited.

Further observations concerning the preparation and properties of catalase from different sources.—I, Crystalline lamb liver catalase. II, Preparation of crystalline beef liver catalase by use of acetone or alcohol, A. L. DOUNCE. (Cornell Univ.). (*Jour. Biol. Chem.*, 143 (1942), No. 2, pp. 497-501, fig. 1).—The crystallization and properties of lamb liver catalase are described. Methods for the preparation of crystalline beef liver catalase by the substitution of alcohol or acetone for the solvent dioxane, originally employed, are given. Catalase prepared by using alcohol or acetone is practically identical with that obtained by the dioxane method.

Dairy glassware is carefully checked (*Farm Res. [New York State Sta.]*, 9 (1943), No. 1, p. 20).—From June 16, 1941, to May 15, 1942, the station checked the accuracy of 46,963 pieces of milk- and cream-testing glassware, finding only about 1.5 percent to be defective.

Note on an accurate wet combustion method for the determination of carbon in soils, P. ALPER (*Jour. Agr. Sci. [England]*, 32 (1942), No. 4, p. 389).—An improvement in the apparatus used in making the determination is presented.

Improved procedure for preparation of carcasses of small animals and skeletal parts of larger animals for chemical analysis, G. LEAVELL. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 1, pp. 159-163).—The procedures described involve autoclaving at 15 lb. pressure in sealed containers for periods of from 3 to 8 hr., depending upon the nature of the samples, and subsequently grinding in a chilled or frozen state. The autoclaved samples are sterile and may be stored indefinitely before being ground. Since the final mixtures are of mushy consistency, samples for final analysis are best weighed by difference from covered weighing bottles. Results of ash determinations on the sample prepared as recommended and on fractions obtained during grinding indicate that the procedure described provides representative samples, but that parts trapped in the grinder must be removed and crushed and added to the main portion, since it is the high ash containing parts that tend to be trapped. Observations on the efficiency of two grinders of different design of fluting are presented.

Conductometric determination of ammonia: Application to nitrogen distribution studies, R. H. HENDRICKS, M. D. THOMAS, M. STOUT, and B. TOLMAN. (U. S. D. A. et al.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, pp. 23-26, fig. 1).—The absorption of ammonia by boric acid after vacuum distillation or volatilization by aspiration was satisfactorily accomplished if sintered-glass bubblers and sufficient excess of boric acid were employed. It may be necessary to use butyl alcohol in the absorbing solution in some cases. The change in the conductance of the solution provided a simple and accurate method of measuring the amount of ammonia absorbed. Although sulfuric acid is a better ammonia absorbent than boric acid and gives a larger change of conductance, boric acid is preferred in general use because of its convenience. Sulfuric acid may be more suitable in some cases, particularly in microanalyses. The method was applied to nitrogen distribution studies of plant materials and to automatic determination of traces of ammonia in air.

The investigation of amino acid reactions by methods of non-aqueous titrimetry, I-III (*Jour. Biol. Chem.*, 144 (1942), No. 1, pp. 193-227, figs. 2).—The first of these three papers notes work on general behavior of amino acids in titrations with perchloric acid in acetic acid solution, the second deals especially with the hydroxyamino acids, and the third with a method of quantitative determination based on acetylation of hydroxy, amino, and, in part, sulphydryl groups.

I. Acetylation and formylation of amino groups, J. J. Kolb and G. Toennies (pp. 193-201).—An exploratory study of the rates of formation of N-acetyl and N-formyl derivatives of amino acids by the action of acetic anhydride and formic acid-acetic anhydride in acetous solutions was made. It was found that the course of these reactions can be followed by titration with perchloric acid in acetic acid solution, because of the loss of basicity resulting from acylation of amino groups, and that the acetamido and formamido groups possess definite residual basic properties which are different and characteristic for each type.

II. Differential acetylation of hydroxy groups, and a method for the preparation of the O-acetyl derivatives of hydroxyamino acids, W. Sakami and G. Toennies (pp. 203-217).—Investigation of the reactions of hydroxyamino acids with acetic anhydride, in acetic acid in the presence of perchloric acid, showed that while the acetylation of amino groups is increasingly suppressed by increasing acidity the acetylation of hydroxy groups is catalytically promoted by the perchloric acid. The consumption of acetic anhydride is determined in these experiments by a titrimetric method which is based on the fact that amino groups on acetylation tend to lose their basic properties with respect to acetous

perchloric acid. It was found that in the aceteous system, in the presence of excess perchloric acid, the hydroxyamino acids may be quantitatively acetylated solely on the hydroxyl group. A method for the preparation of the new compounds O-acetylhydroxyproline, O-acetylserine, O-acetylthreonine, and O-acetyltyrosine, based on the findings outlined, is presented. The method was found useful for the preparation of other related compounds.

III. *The determination of hydroxy (and analogous) groups in amino acids*, G. Toennies and J. J. Kolb (pp. 219-227).—It is shown that hydroxy and analogous ($-\text{NH}-$ of tryptophan, $=\text{NH}$, and, imperfectly, $-\text{SH}-$) groups can be determined in dry amino acids by an aceteous titrimetric method based on the acid-catalyzed acetylation of these groups by acetic anhydride. The evidence obtained indicates that the reaction employed may furnish a way for preparing the unknown S-acetylcysteine, the imino-N-acetyl derivative of arginine, and the indole-N-acetyl derivative of tryptophan. Among the amino acids studied, cystine showed an exceptional behavior in that it reduced perchloric acid under the prevailing conditions. Diphenylguanidine was found a suitable primary standard for aceteous perchloric acid.

A du Pont type semimicronitrometer, P. J. ELVING and W. R. McELROY. (Purdue Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, pp. 84-88, figs. 4).—The instrument described is of the compensating type, the quantity of gas being read at the volume it would occupy at standard conditions of temperature and pressure. Two models of the nitrometer were developed, one hand-shaken like the macronitrometers and the other motor-shaken. Various inorganic and organic nitrates, including nitrocelluloses, were successfully analyzed.

A new color test for tryptophane in protein hydrolysates, A. A. ALBANESE and J. E. FRANKSTON (*Jour. Biol. Chem.*, 144 (1942), No. 2, pp. 563-564).—The protein sample was hydrolyzed by being boiled under a reflux for from 20 to 22 hr. with 5 cc. of 20 percent NaOH per gram of sample. The hydrolyzate was neutralized to pH 7 with glacial acetic acid. Silica (from slight distintegration of the glass vessel) was filtered off and the volume of the filtrate adjusted so that 2 cc. contained approximately 1 mg. of tryptophan. A 2-cc. sample of filtrate in a colorimeter tube marked at 5 cc. was treated with 0.3 cc. of sodium nitrite and 0.1 cc. of 10 percent acetic acid and the mixture shaken intermittently for 10 min. There were then added 0.3 cc. of potassium persulfate (1 percent), 0.5 cc. of thymol (1 percent in 95 percent ethanol), and 5 cc. of a mixture of 3 parts of 40 percent trichloroacetic acid and 2 parts of concentrated hydrochloric acid, with thorough mixing after each addition. The tube was immediately placed in a boiling water bath for 5 min. and cooled in an ice bath for 5 min. The sample separated into two layers—an almost colorless aqueous layer above and a red layer of ethyl trichloroacetate below. All but approximately 0.3 cc. of the upper aqueous layer was then removed by a capillary pipette, and the colored layer was diluted to the 5-cc. mark with glacial acetic acid. The resulting color was read in a photoelectric colorimeter with a suitable filter and compared with that of a similarly treated tryptophan standard.

Colorimetric microdetermination of arsenic after evolution as arsine, E. B. SANDELL. (Univ. Minn.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, pp. 82-83, figs. 2).—The method described is based on the absorption of arsine in an acid solution of mercuric chloride containing permanganate. **Arsine** is oxidized in one step to arsenate, and arsenic can then be determined in the solution by adding an excess of ammonium molybdate-hydrazine sulfate and heating to obtain the molybdenum blue.

Analysis of plant extracts for chlorophylls a and b, using a commercial spectrophotometer, C. L. COMAR. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 11, pp. 877-879, fig. 1).—Absorption coefficients for the chlorophyll components as determined on a commercially available photoelectric spectrophotometer of high accuracy and purity of radiation were successfully applied to the analysis of plant extracts for chlorophylls *a* and *b*.

Determination of methol in oil of peppermint: Acetyl chloride as a reagent, B. E. CHRISTENSEN and L. PENNINGTON. (Oreg. State Col.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, pp. 54-55).—Acetyl chloride was found a quicker and simpler reagent than acetic anhydride for the acetylation. In the method described the oil is treated with the acetyl chloride, the excess of the chloride is then hydrolyzed by adding water, and the total acidity is determined with 0.3 N sodium hydroxide, the chloride content with silver nitrate (0.3 N) as precipitant and potassium chromate solution as indicator. The results obtained in using acetyl chloride were as accurate as those given by the anhydride and the analytical process was much more rapid.

Determination of citric acid in pure solutions and in milk by the pentabromoacetone method, E. F. DEYSHER and G. E. HOLM. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, pp. 4-7, figs. 2).—The authors discuss losses occasioned by incomplete bromination, volatilization of the pentabromoacetone precipitate varying with the temperature of the wash water, etc., and conclude that "no absolute method can be prescribed for the complete recovery of citric acid as pentabromoacetone under all conditions. The method must be standardized with respect to the conditions and products employed and corrections made for the losses incurred in each case." They describe, however, a procedure by the use of which aliquots of solutions containing from 0.10 to 0.30 gm. of citric acid gave results that were consistently within ± 0.50 percent of the theoretical values. When the quantity of citric acid was less than 0.10 gm. the percentage recoveries were slightly less than the value given, and the results were not so consistent as those obtained with the use of larger amounts.

Colorimetric determination of phenothiazine, H. L. CUPPLES. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 1, p. 53).—In relatively high concentrations of phenothiazine the red color normally produced on adding bromine to the alcoholic solution may be replaced in part by a green compound interfering with the colorimetric determination. The experimentally controllable factors found to favor the formation of the normal red color were quick addition of the bromine water with rapid stirring, addition of the phenothiazine solution to an excess of bromine water, and having the solutions warm (60° C.) when developing the color. When the solution contained plant extractives, it was necessary to allow some time for bromination and to make sure that bromine was present in excess. A suitable determinative procedure is described.

Estimation of haemoglobin by the alkaline haematin method, J. W. CLEGG and E. J. KING (*Brit. Med. Jour.*, No. 4263 (1942), pp. 329-333, figs. 2).—Details of methods for the estimation of total hemoglobin, using hemin as a standard, are given, together with instructions for the preparation of standard solutions equivalent to 100 percent of the Haldane, Sahli, and Haden scales. The alkaline hematin method was found to give excellent results and to permit a quicker and more reliable determination than other methods in routine work.

Relation of chemical analyses of liver to its vitamin A potency, G. S. FRAPS, A. R. KEMMERER, and R. TREICHLER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 2, pp. 529-532).—Extracts of the livers were pre-

pared by saponifying the tissue with alcoholic KOH, extracting with ether, removing the ether from the extract in vacuo, taking up the residue in 95 percent alcohol, and filtering off the solids which separated upon standing for 2 hr. in an ice-salt mixture. The filtrate obtained was used for spectroanalysis and for biological assay. The spectrovitamin A was determined by a method previously described (E. S. R., 79, p. 100), correction being made for absorption of light by carotenoids, and with the use of the extinction coefficient 1,600. In the bioassay the growth of rats on various dilutions (made with Wesson oil) of the filtrate was compared with growth on standard carotene solutions by a modified U. S. P. method for vitamin A potency. Of the 18 livers (beef, calf, pork, and lamb) analyzed, 12 contained 45 p. p. m. or more of spectrovitamin A, and the others 44 p. p. m. or less. The livers containing 45 p. p. m. or more assayed approximately 5 U. S. P. units per microgram of spectrovitamin A. For these, biological potency in International Units can be calculated by the equation $Iu=5.0 S+1.7 C$, where Iu is the number of International Units per gram, S is the spectrovitamin A in parts per million, as found by use of the extinction coefficient 1,600, and C is carotene in parts per million. For the livers containing less than 45 p. p. m., the factor to be used for multiplying the spectrovitamin A is probably lower, but the results did not show definitely where the line should be drawn. The tentative equation suggested is $Iu=1.5 S+1.7 C$.

A polarographic characterization of nicotinic acid and related compounds.—I, Pyridine and nicotinic acid, P. C. TOMPKINS and C. L. A. SCHMIDT (*Jour. Biol. Chem.*, 143 (1942), No. 3, pp. 643-653, figs. 3).—The authors find that use of the polarograph cannot be recommended for the analysis of pyridine. If the attempt be made to determine pyridine polarographically, heavily buffered solutions (at least 0.1 N) should be used. Sodium or potassium phosphate buffers in the pH range 6-8 proved most suitable. The polarograph may be used for the determination of nicotinic acid, but owing to the extraordinary effect of pH and buffer capacity on the diffusion current constant, extreme care must be used in its application. The H^+ at the electrode surface must be maintained constant at all times during a determination. The best current-concentration values were obtained in acid solutions. Although good waves could be obtained in sodium acetate, citrate, and bicarbonate solutions, the precision was not sufficiently high to warrant use for quantitative determinations. Various numerical data and observations concerning the behavior of the two compounds in electrolysis in a dropping mercury electrode apparatus are recorded.

Nicotinic acid content of cereals and cereal products: Microbiological method of assay, J. S. ANDREWS, II. M. BOYD, and W. A. GORTNER (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 8, pp. 663-666, fig. 1).—Nicotinic acid values obtained for cereals and cereal products by the microbiological method of Snell and Wright (E. S. R., 87, p. 12) varied widely, depending upon the type of extraction employed. Water and dilute acids were comparable extraction media, and alkali and stronger acids were also comparable but gave values about twice as high as the former extraction media. This difference was attributed either to the formation of growth-stimulating substances by the latter solvents or to the liberation of active nicotinic acid compounds by hydrolysis of a less active or inactive precursor. Recovery experiments were quantitative regardless of the type of extraction, thus indicating that growth-promoting substances were not formed, since these would be expected to result in variable recoveries. Lengthening of the growth period in the assay procedure resulted in no increase in values, this also indicating that no stimulators were present.

On the other hand, results of dialysis of aqueous extracts of whole-wheat flour against water by means of cellophane membranes suggested that some hydrolyzable factor with slower diffusion rate was present along with "free" nicotinic acid compounds. It is pointed out that if this is true the choice of extraction procedure required for evaluating cereals would depend on the nutritional availability of the activity liberated by hydrolysis. The distribution of nicotinic acid in a complete set of fractions separated in the commercial milling of wheat was determined by microbiological assay of aqueous and alkaline extracts. Wheat germ, unlike bran and endosperm, did not exhibit increased activity on alkaline hydrolysis; in this respect it resembled yeast and animal tissues. This suggested the possibility of a more readily available form of nicotinic acid activity in biologically active tissues than in storage tissues where hydrolysis is required to liberate complete activity. The distribution of nicotinic acid activity in the various milling fractions differed from that of thiamin and riboflavin. Concentration of nicotinic acid was greatest in the bran.

Extraction and assay of nicotinic acid from animal and plant tissues: Comparison of methods. V. H. CHELDELIN and R. R. WILLIAMS (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 8, pp. 671-675).—"At the present time some 25 methods or modifications of methods for the determination of nicotinic acid have appeared in the literature, and several points of controversy exist as to what experimental steps are to be preferred. The present paper is a report of progress with various aspects of this problem as applied to a number of natural substances." The results of the study are summarized as follows:

"Digestion of foodstuffs with takadiastase and papain appears to liberate nicotinic acid completely from a variety of materials. Enzymatic digestion or acid or alkaline extraction gives the same values for nicotinic acid content of meats and milk. Extraction of cereals with acid or alkali, or similar treatment of clear cereal extracts, gives higher nicotinic acid values than enzymatic liberation alone. The increases caused by acid treatment of cereals or cereal extracts are apparently due to the presence in cereals of some substances other than trigonelline which is convertible to nicotinic acid. The increases due to alkaline treatment of cereals or cereal extracts are apparently largely due to the conversion of the substance mentioned [by Dann and Handler (*E. S. R.*, 87, p. 14)], but perhaps partly to conversion of trigonelline into nicotinic acid. That the biologically active substance formed by hydrolysis of the hypothetical precursor is actually nicotinic acid is indicated by consonant determinations of it by both microbiological and chemical methods, provided in the latter case preformed color is removed prior to coupling with metol. Whether the hypothetical precursor substance has antipellagric value is unknown."

Report on riboflavin. A. R. KEMMERER. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 25 (1942), No. 2, pp. 459-464).—This report of the associate referee on riboflavin deals with an extension of collaborative work (*E. S. R.*, 86, p. 152) in the application of the fluorometric and the microbiological methods in the determination of riboflavin in dehydrated alfalfa meal, whole-wheat flour, and white flour. It appeared that the methods were satisfactory for alfalfa meal, a substance rich in riboflavin, but that both methods were in need of further improvement for satisfactory application to wheat flours and perhaps other cereals. It is recommended that these two methods, tentatively adopted in 1940 for the determination of riboflavin in yeast and dried skim milk, be adopted also for alfalfa. The microbiological method was also recommended for tentative adoption for whole-wheat flour and white flour because of the need for a method for this type of product. It is further recommended "that in the microbiological

method the effect of reducing the number of levels of the test material and standard and increasing the number of tubes on each level be studied; that studies on the microbiological method be continued in order to eliminate the effect of materials that may enhance or inhibit the bacteria and to further improve it; that fluorometric methods be further studied."

Effect of light on riboflavin solutions: **Effect of sunlight on reduced and unreduced solutions,** G. M. O'MALLEY and C. W. SIEVERT (*Indus. and Engin. Chem.*, 34 (1942), No. 9, pp. 1117-1118).—Two extracts of defatted milk solids and one solution of synthetic riboflavin, each prepared in 2 percent acetic acid and adjusted to pH 4.5 with sodium acetate, were used in these tests employing suitably diluted aliquots, some of which were reduced with hydrosulfite solution according to the method of Hodson and Norris (*E. S. R.*, 83, p. 151). Reduced and unreduced extracts were exposed for 30 min. to sunlight shining through a laboratory window. After exposure, the solutions in which the riboflavin had been reduced were vigorously shaken with access to air to reoxidize the riboflavin. Results of analyses of reduced and unreduced solutions, both before and after exposure to sunlight, showed that about 90 percent of the riboflavin in the unreduced solutions was destroyed by the exposure to sunlight, but that the destruction was cut to a comparatively small figure by reducing the solution with hydrosulfite before exposure. Reduction of the riboflavin solution by the unstable hydrosulfite did not protect the solution when heat was applied, since the heat drove off the volatile reducing agent, and the riboflavin, reoxidized by the air, was destroyed upon exposure to the sunlight.

Growth stimulants in the microbiological assay for riboflavin and pantothenic acid, J. C. BAUERNFEIND, A. L. SOTTER, and C. S. BORUFF (*Indus. and Engin. Chem., Analyt. Ed.*, 14 (1942), No. 8, pp. 666-671, figs. 2).—The microbiological assay procedure employed for the determination of riboflavin was that of Snell and Strong (*E. S. R.*, 82, p. 587) and for pantothenic acid that of Pennington et al. (*E. S. R.*, 85, p. 442) with slight modifications. *Lactobacillus casei* was used as the test organism, its growth response being determined by titer of the lactic acid produced after a 72-hr. incubation period. The extract was prepared by autoclaving from 0.5 to 1.0 gm. of the sample with from 25 to 35 cc. of water for 15 min. at 15 lb. pressure, cooling, and twice repeating the procedure with the residue separated from the supernatant fluid after centrifuging. The final residue was resuspended in distilled water, made to volume, and an aliquot was mixed with a corresponding aliquot of the clarified extract. The results of the riboflavin assay of the clarified water extract and of the water extract with solids suspended were in good agreement in the case of dried skim milk, alfalfa leaf meal, and one sample of liver meal. Higher riboflavin values were obtained on meat scrap, fish meal, distillers' dried solubles, and a second sample of liver meal, by assay of the extracts with solids suspended than by assay of the clarified extracts. The extracted residues added to the basal medium produced no significant increase in growth over that of the basal medium, indicating that the riboflavin had been completely extracted by the extraction procedure. In the presence of a suboptimum amount of synthetic riboflavin (0.10 μ g. per tube) certain of the extracts, however, did exert a growth-promoting effect apparently due to the presence of some growth-stimulating substance. Photolyzed aqueous suspensions of certain of the foodstuffs and a number of organic compounds tested also exerted a stimulating action in the presence of suboptimum amounts of riboflavin. Several of the compounds were likewise found to exert this growth-stimulating effect on the micro-organism in the presence of suboptimum amounts of pantothenic acid. It is emphasized that this stimulating effect, when detected, may be avoided by (1) the use of clarified extracts, (2) preliminary extraction of the sample with a lipid solvent,

or (3) inclusion of photolyzed extracts of the product in the riboflavin assay medium or by an alkaline- or acid-treated extract of the product in the pantothenic acid assay medium.

A simple method for the clinical estimation of ascorbic acid in whole blood, J. DEENY, E. T. MURDOCK, and J. J. ROGAN (*Biochem. Jour.*, **36** (1942), No. 3-4, pp. 271-272).—The method, described as to reagents, procedure, and calculation, is based on the fact that saturation of whole blood with CO prevents the oxidation of ascorbic acid when blood is hemolyzed. An advantage of the method is that it requires only 2 cc. of blood.

An improved photometric method for ascorbic acid, C. CARRUTHERS (*Indus. and Engin. Chem., Analyt. Ed.*, **14** (1942), No. 10, pp. 826-828).—The improved microphotometric method described for ascorbic acid determination was based upon the difference in transmission of buffered 2,6-dichlorophenolindophenol before and after reduction. Reduction was carried out at pH 2.5-2.7 and transmission 6.5-6.6. To inhibit the interference due to other reducing substances, such as glutathione and cysteine, mercuric chloride was added to the blue dye solution. Frequent restandardization was unnecessary, and changes in the ascorbic acid equivalency could be read directly from the transmittance-concentration curve.

Use of toes rather than tibiae in A. O. A. C. chick method of vitamin D determination, F. D. BAIRD and M. J. MACMILLAN (*Jour. Assoc. Off. Agr. Chem.*, **25** (1942), No. 2, pp. 518-524, fig. 1).—Data were obtained in the course of routine A. O. A. C. chick tests, using middle or inside toes, severed at the middle joint and used without cleaning away the covering tissues or removing the nail. The results, presented and discussed, showed that the percentage of ash of middle toes of chicks is a satisfactory criterion for the interpretation of results by this test, and can be used as well as values for tibiae ash in estimating the vitamin D potency of assay oils by the A. O. A. C. method. "The use of toes rather than tibiae eliminates the labor and time involved in removing the tibiae from the chick and cleaning them of all adhering flesh, and it also eliminates the human error in removing inadequate amounts of flesh from some of the tibiae. In the vitamin D determination the use of toes makes possible the carrying out of the test without sacrificing the chick. Furthermore, it could provide several composite samples, in addition to the tibiae, for ashing from any assay group and also of following the course of calcification in the same chicks over varying periods of time."

Pectin in war-time has many uses: An important outlet for waste apple pomace, Z. I. KERTESZ (*Farm Res. [New York State Sta.]*, **9** (1943), No. 1, pp. 1, 3).—The author summarizes, in part, the numerous uses of pectin for food, medicinal, and other purposes, and points out that in 1941 the elder and apple juice producers dried for pectin manufacture less than 10 percent of the apple pomace which was available as a byproduct. The rest of the pomace was practically discarded. The utilization, to whatever extent shortages in equipment, materials, and skilled labor will permit, of this wasted source of pectin would help to meet the increased wartime demand.

AGRICULTURAL METEOROLOGY

Basic principles of weather forecasting, V. P. STARR (*New York and London: Harper & Bros.*, [1942], pp. XXVI+299, [pl. 1], figs. 125).—The particular features which the author desires to bring to the fore in this textbook are "(1) the statement of certain forecasting principles which are now coming into use, and the manner of their application; (2) the introduction of more systematic procedures in actual forecasting; (3) the advantage of constructing prognos-

tic charts for both the surface weather conditions and for the condition in the free atmosphere; (4) the introduction into daily forecasting of checking devices to insure the mutual consistency of certain features of the expected developments."

Meteorology (8. *Amer. Sci. Cong., Washington, 1940, Proc., vol. 7, pp. 291-446, pls. 4, figs. 38*).—In 29 contributions (abstracts or full papers in English or Spanish) by various authors, different phases of meteorological conditions and studies in North and South American countries are presented.

Evaporation from lakes and reservoirs: A study based on fifty years' [U. S.] Weather Bureau records, A. F. MEYER (St. Paul: Minn. Resources Comm., 1942, pp. 111+56, [pls. 91], figs. [11]).—The monthly and annual evaporation from lakes and reservoirs in the United States, as determined in this study, is presented in map, graphic, and tabular forms for use in agriculture and forestry, for convenience in the design, construction, operation, and maintenance of various types of waterworks, and for use in further meteorologic and hydrologic studies.

Characteristics of heavy rainfall in New Mexico and Arizona, L. B. LEOPOLD (Amer. Soc. Civ. Engin. Proc., 69 (1943), No. 2, pp. 205-234, figs. 5).—Seasonal differences in storm types are characteristic of New Mexico and Arizona. Summer storms are ordinarily of small areal extent and typically of high intensity rainfall in a well-defined pattern with relation to time; winter storms cover large areas and are usually of low intensity. Results of frequency analyses of one-day rainfalls are here presented for all stations in the two States with records exceeding 15 yr. The relation of rainfall frequency to geographic position and topographic relief are discussed.

1942 driest year in 54-year record at State College, R. WOODBURN (Miss. Farm Res. [Mississippi Sta.], 6 (1943), No. 1, pp. 1, 7, figs. 2).—The 1942 rainfall by months as compared with the 54-yr. average and fluctuations in rainfall from year to year for 3 typical months are tabulated and discussed.

Hydrologic studies at the South Fork Palouse River Demonstration Project, SCS-Wash-1, Pullman, Washington: Compilation of rainfall, run-off and soil loss from the South Fork Palouse River, Fourmile Creek, and Missouri Flat Creek, 1934-40, W. D. POTTER and S. K. LOVE (U. S. Dept. Agr., Soil Conserv. Serv., 1942, SCS-TP-47, pp. [280], pls. 17).

Hydrologic studies at the Coon Creek Demonstration Project SCS-Wis-1, Coon Valley, Wisconsin: Compilation of rainfall, run-off, and soil loss from the Little La Crosse River and Coon Creek Watersheds, 1934-40, W. D. POTTER and S. K. LOVE (U. S. Dept. Agr., Soil Conserv. Serv., 1942, SCS-TP-46, pp. [308], pls. 36).

Snow surveys and irrigation water forecasts for the Colorado River Drainage Basin, February 1, 1943 (U. S. Dept. Agr., Soil Conserv. Serv., and Colorado Sta., 1943, pp. [1]+6).

Snow surveys and irrigation water forecasts for the Missouri and Arkansas Drainage Basins, February 1, 1943 (U. S. Dept. Agr., Soil Conserv. Serv., and Colorado Sta., 1943, pp. [1]+9).

Snow surveys and irrigation water forecasts for Oregon as of February 1 and March 1, 1943 (U. S. Dept. Agr., Soil Conserv. Serv., and Oregon Sta., 1943, Feb., pp. [1]+16, pls. 2; Mar., pp. [1]+13, pls. 2).

Snow surveys and irrigation water forecasts for the Rio Grande Drainage Basin, February 1, 1943 (U. S. Dept. Agr., Soil Conserv. Serv., and Colorado Sta., 1943, pp. [1]+3).

Perennial snow and glaciers, J. E. CHURCH. (Nev. Expt. Sta. et al.). (Sci. Mo., 56 (1943), No. 3, pp. 211-231, figs. 17).

SOILS—FERTILIZERS

[**Soil investigations by the Arkansas Station**] (*Arkansas Sta. Bul.* 428 (1942), pp. 15-16).—Factors affecting the availability and efficiency of fertilizers are discussed by J. R. Cooper.

[**Soil investigations by the Oklahoma Station**] (*Oklahoma Sta. Bion. Rpt.* 1941-42, pt. 1, pp. 6, 16-17, 18, 19, figs. 3).—Investigations are briefly reviewed on the value of a livestock system of farming for maintaining soil fertility and the effect of rainfall on soil crust formation and suggestions on cultivation for obtaining the best results under conditions of soil crust.

[**Physical land conditions in Chariton County, Missouri**, D. C. MAXWELL (Coop. Mo. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv., Phys. Land Survey No. 25* (1942), pp. 56, figs. 13, maps [92]).—Results of a detailed soil and erosion survey.

[**Soil-moisture conditions and phenomena in frozen soils**, A. B. C. ANDERSON, J. E. FLETCHER, and N. E. EDLEFSEN. (Univ. Calif.). (*Amer. Geophys. Union Trans.*, 23 (1942), pt. 2, pp. 356-364, figs. 4).—A basic treatment of the thermodynamic theory involved in the interpretation of soil-moisture phenomena in frozen soils.

[**Determination of the losses of moisture by evaporation from soils in a watershed-area**, A. H. HENDRICKSON. (Univ. Calif.). (*Amer. Geophys. Union Trans.*, 23 (1942), pt. 2, pp. 471-474).—A discussion of methods and factors involved in determining the moisture evaporated from watershed areas.

[**Investigations in erosion control and reclamation of eroded land at the Red Plains Conservation Experiment Station, Guthrie, Okla., 1930-40**, H. A. DANIEL, H. M. ELWELL, and M. B. COX. (Coop. Okla. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul.* 837 (1943), pp. 94, figs. [48]).—The first of a series of reports intended to cover the first decade of investigational work at the 10 original soil erosion experiment stations. Results of experiments in methods of erosion control are given for plats of various sizes, individual terraces, and terraced and natural watersheds under different conditions of vegetative cover, cultivation, cropping system, or terrace design, and the comparative effectiveness of these conditions was determined by measured soil and water losses, crop yields, and observations. The investigational results are interpreted in relation to their application to the Red Plains area. Detailed data for the various conditions are presented in tabular form in the appendix.

[**Strip cropping for war production**, H. E. TOWER and H. H. GARDNER (*U. S. Dept. Agr., Farmers' Bul.* 1919 (1943), pp. 11+46, figs. 36).—Strip cropping methods are described and illustrated by four regions in the United States—The Northeastern and North Central States, the Southeastern and West Gulf States, the Great Plains, and the far West. This publication supersedes Farmers' Bulletin 1776 (E. S. R., 77, p. 864).

[**The farmer and his soil have volunteered**, C. E. MILLAR (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 199-203).—Such important points in soil management as proper tillage, use of manure and fertilizers, what crops to fertilize, use of green-manure crops, and the value of lime are discussed.

[**Soil fertility level as it influences plant nutrient composition and consumption**, R. E. LUCAS, G. D. SCARSETH, and D. H. SIELING (*Indiana Sta. Bul.* 468 (1942), pp. 43, figs. 7).—Nitrogen, phosphate, potash, magnesium, and calcium were determined for corn, wheat, oats, alsike and red clover, soybeans, timothy, and lespedeza grown on long-time soil fertility plats located on Crosby, Bedford, and Clermont silt loams for 3 consecutive years. Detailed data on the chemical composition of the crops grown are given in the appendix.

The data show that for the long-time fertility plats about 70 percent of the added phosphorus is recovered by the crops in a 4-yr. rotation of wheat, hay, corn, and soybeans on limed plats of Clermont and Bedford silt loam soils, while on the unlimed plat in both soils only about 50 percent of the phosphate is recovered. Unfertilized Crosby soil contributed about 20 lb. of phosphate per acre annually to the crop. The average annual amount of potash contributed to crops on unfertilized Bedford, Clermont, and Crosby silt loam was around 20, 25, and 30 lb. per acre, respectively. After about 20 yr. of treatment, differences in the composition of the soil with respect to phosphate and potash were not great.

The authors point out that soil series, soil treatments, and seasons influence greatly the percentage of plant nutrients in farm crops, and that straw and stover vary more in composition than the grain and should be used when determining plant-nutrient levels. They suggest that a selective translocation of plant nutrients, particularly at maturity, accounts for the even composition of the grain.

Chlorpicrin as a factor in the mobilization of soil nutrients, A. M. SCHCHEPETIL'NIKOVA and V. CHEREMISOVA (*Larvacide Log*, 5 (1942), No. 2, pp. 32-49, figs. 12).—A translation from the Russian.

Effect of soil and peat admixtures on the growth of plants in quartz sand, P. L. GILE and I. C. FEUSTEL. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 66 (1943), No. 2, pp. 49-65).—Additional data (E. S. R., S2, p. 595) are presented on the effect of soil and peat mixtures with quartz sand in an attempt to explain the beneficial response previously obtained from mixtures of pure quartz and soil. The beneficial effect of a soil admixture with quartz sand is reported as being due to the buffer capacity of the soil and the iron provided by the soil. The authors also point out the importance of determining the reaction in the immediate vicinity of the growing root instead of in the entire growth medium.

Soil tests and soil fertility discussed: 'Salvage manure' is war-vital slogan now, R. GARDNER (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 1, pp. 17-19).—A popular presentation of factors to be considered in obtaining the maximum benefit from fertilizers and manures for increased production. Chemical soil tests are discussed in relation to obtaining more efficient use of fertilizers.

Utilization of fertilizers during 1943, W. B. ANDREWS (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 1, pp. 1, 8).—The author discusses the shortage of nitrogen for farm production because of the demands for war purposes and emphasizes the importance of using available nitrogen so that it will contribute most to winning the war and to farm profit.

Nitrogen content of miscellaneous waste materials, A. L. PRINCE and F. E. BEAR (*New Jersey Stat. Cir.* 450 (1942), pp. 4).—Because of the demands for nitrogen for ammunition, the authors point out the importance of utilizing different natural materials and waste products that have a fertilizer value. As a guide for determining the value of various potential fertilizer materials, average analyses are given on fertilizer constituents in 9 manures, 11 humuslike materials, 15 crop materials, and 15 miscellaneous wastes.

Chemical composition of sewage sludges, with particular reference to their phosphoric acid contents, W. RUDOLFS and H. W. GEHM (*New Jersey Stat. Bul.* 699 (1942), pp. 15).—The authors find that the value of various types of sewage sludge as a subgrade fertilizer or soil builder cannot be determined by chemical analyses alone, but must be judged by the results it produces. Sludges are not balanced plant foods but contain major and minor mineral elements, growth-promoting substances, and a varying amount of organic matter.

The average total phosphoric anhydride content of sludge varies with the type of sewage treatment from about 1.5 to 4.6 percent. Digested sludge contains more phosphoric acid than plain settled sludge. Activated and humus tank sludge have greater percentages of phosphoric anhydride than settled sludge, and digested chemical sludge has the highest phosphoric anhydride content. Chemical treatment does not increase the insoluble phosphoric acid. The method of dewatering affects the phosphoric anhydride content of the sludges. Activated and plain settled sludges have higher volatile matter contents and greater moisture-holding capacities than digested sludges.

Phosphate and lime for pasture, H. W. BENNETT (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 1, pp. 1, 7, fig. 1).—This popular article brings out the beneficial effect of moderate applications of phosphorus and small quantities of lime for increasing pasture returns on sandy, silt, or clay soils.

The influence of neutralizing acid-forming fertilizers with dolomitic limestone on the response of cotton to potash, J. G. FUTREL and J. J. SKINNER. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 223 (1942), pp. 15).—Seven soil types were included in a comparative study of acid- v. non-acid-forming fertilizers, the non-acid-forming fertilizers having been neutralized with dolomitic limestone. The effect of the dolomitic limestone on potash availability was determined with cotton. Fertilizers containing dolomitic limestone gave larger yields of cotton than acid-forming fertilizers on Cecil fine sandy loam, Clarksville gravelly loam, and Norfolk and Appling sandy loam soils. Only a small increase in yield resulted from non-acid-forming fertilizers over acid-forming on Orangeburg, Tifton, and Greenville sandy loams. Using dolomitic limestone to neutralize acid-forming fertilizers resulted in practically the same increase in yield without regard to the potash content of the fertilizer. The authors thus conclude that neutralizing acid-forming fertilizers with dolomitic limestone does not materially affect the crop's response or requirement for potash.

The pH values and lime-requirements of 20 New Jersey soils, F. E. BEAR and S. J. TORII (*New Jersey Stat. Cir.* 446 (1942), pp. 15, figs. 2).—Tabular information on pH, lime requirement, and calcium-storing capacity is presented for 20 of the most widely distributed types of soil in New Jersey. Selected soil types were studied to determine soil pH before and after applying lime and at weekly intervals following an application of 4,000 lb. of limestone per acre. The relative effects of equivalent amounts of different liming materials was determined with Dutchess shale loam soil from changes in pH value.

Inspection of commercial fertilizers, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir.* 275 (1942), pp. 79, fig. 1).—This publication presents the usual analyses and statistical data on fertilizers as required by the Indiana fertilizer law.

Inspection of commercial fertilizers and agricultural lime products, P. H. SMITH ET AL. (*Massachusetts Sta. Control Ser. Bul.* 114 (1942), pp. 48).—This report covers both mixed fertilizers and separate sources of nitrogen compounds, phosphates, and potassium salts, as well as liming materials and gypsum. The 1942 inspection analysis data for each of these products are recorded.

AGRICULTURAL BOTANY

Growth of bacteria in an iron-free medium, W. S. WARING and C. H. WERKMAN. (*Iowa State Col.*). (*Arch. Biochem.*, 1 (1942), No. 2, pp. 303-310, fig. 1).—An Fe-deficient medium is described which produces cells of certain bacterial species very deficient in Fe.

The cytology of bacteria, I. M. LEWIS (*Chron. Bot.*, 7 (1942), No. 6, pp. 249-250).—A review of recent work.

The biochemistry of autotrophic bacteria: The metabolism of *Thiobacillus thiooxidans* in the absence of oxidizable sulfur, G. A. LePAGE. (Wis. Expt. Sta.). (*Arch. Biochem.*, 1 (1942), No. 2, pp. 255-262).

p-Aminobenzoic acid, a growth factor for *Acetobacter suboxydans*, J. O. LAMPEN, L. A. UNDERKOFER, and W. H. PETERSON. (Univ. Wis. and Iowa State Col.). (*Jour. Biol. Chem.*, 146 (1942), No. 1, pp. 277-278).

***Zygosaccharomyces acidifaciens*: A new acetifying yeast**, W. J. NICKERSON, JR. (*Mycologia*, 35 (1943), No. 1, pp. 66-78, figs. 4).—*Z. acidifaciens* n. sp., a yeast found in apparently pure culture in domestic red wine turning sour, is described.

Distribution of antagonistic fungi in nature and their antibiotic action, S. A. WAKSMAN and E. S. HORNING. (N. J. Expt. Stas.). (*Mycologia*, 35 (1943), No. 1, pp. 47-65, figs. 7).—Preliminary to this systematic survey of antagonistic fungi, methods were developed for their rapid isolation from soils, manures, composts, and other natural substrates. No previous enrichment of the soil with bacteria proved necessary. After first establishing their antagonistic nature on solid media, these fungi were grown in liquid media and their activities further studied. Under the experimental conditions some produced antagonistic substances rapidly; others showed only limited antibiotic activities. The various antagonistic fungi thus isolated and tested were found to belong to a number of distinct taxonomic groups, thus far nine having been recognized. Some of the groups belonging to *Aspergillus* and the green *Penicillium* were particularly active; others, like *Chaetomium* and the *P. luteum* group, had considerable activity; still others, such as species of *Fusarium* and *Cephalosporium*, had very little. One of the most active, the *A. fumigatus* group, was studied in detail, since its strains appeared to differ from all other antagonistic fungi thus far reported. The substance isolated, described, and tentatively designated "fumigacin," possesses antibacterial properties typical of the antibiotic group, viz, it is selective in action. An interesting peculiarity is that it proved more active against *Bacillus mycoides* than against *B. subtilis*, whereas other antibiotic substances tested against these bacteria exhibited the reverse effect. There are 16 references.

Germination of ergot, A. B. BOSE (*Cur. Sci. [India]*, 11 (1942), No. 11, p. 439, fig. 1).—Germination of sclerotia of *Claviceps purpurea* on moist sand in Petri dishes is reported, and the possibility of laboratory production of medicinal ergot suggested.

Palmeiras na Bahia do genero Cocos [Palms of the genus Cocos in Bahia, Brazil], G. BONDAR (*Inst. Cent. Fomento Econ. Bahia, Bol.* 4 (1939), pp. 19, pls. 12).

Importancia economica das palmeiras nativas do genero Cocos nas zonas seccas do interior bahiano [Economic importance of palms of the genus Cocos in the dry regions of the interior of Bahia], G. BONDAR (*Inst. Cent. Fomento Econ. Bahia, Bol.* 5 (1939), pp. 16, pls. 5).

Palmeiras do genero Cocos e descrição de duas especies novas [Palms of the genus Cocos, with descriptions of two new species], G. BONDAR (*Inst. Cent. Fomento Econ. Bahia, Bol.* 9 (1941), pp. 53+[1], pls. 13).

Penão, *Cuidoscolus marcgravii* Polh.: Novo recurso oleifero da Bahia [A new source of oil in Bahia], G. BONDAR (*Inst. Cent. Fomento Econ. Bahia, Bol.* 12 (1942), pp. 16, pls. 4).—A contribution on this euphorbiaceous tree of Brazil, including data on its taxonomy and identification, and on the culinary and industrial (drying) possibilities of the oil from its seed.

Las gramíneas argentinas del género *Echinochloa* [Argentine grasses of the genus *Echinochloa*], R. MARTÍNEZ CROVETTO (*Rev. Argentina Agron.*,

9 (1942), No. 4, pp. 310-342, figs. 8).—A taxonomic study of the six Argentine species and their varieties, with a key.

The grasses of Nova Scotia, W. G. DORE and A. E. ROLAND (*Nova Scotian Inst. Sci. Proc.*, 20 (1941-42), No. 4, pp. 177-288, figs. 84).—This is a systematic treatment of the Gramineae, with identification keys and notes on characteristics, nomenclature, and distribution of the 121 species of the Province. Diagrams illustrating the essential parts of the inflorescence and ligule region, and distributional maps, are included for most species.

A proposed taxonomic change in the tribe Maydeae (family Gramineae), R. G. REEVES and P. C. MANGELSDOFF. (*Tex. Expt. Sta. et al.*). (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 815-817).—As a result of this study *Zea* and *Euchlaena* are considered congeneric, and two species are transferred from the latter as *Z. mexicana* and *Z. perennis* n. combs. A revised characterization of *Zea* is presented.

State floras of the United States, S. F. BLAKE. (U. S. D. A.). (*Chron. Bot.*, 7 (1942), No. 6, pp. 258-261, fig. 1).—This list, annotated and summarized in a map, is extracted from the larger work previously noted (*E. S. R.*, 88, p. 169.)

Mycorrhizae associated with some Colorado flora, W. D. THOMAS, JR. (Colo. State Col.). (*Phytopathology*, 33 (1943), No. 2, pp. 144-149, fig. 1).—Through this study of certain members of the Colorado flora (about 116 species in 43 families), their mycorrhizas were classified into four main forms. (1) Ectotrophic forms appeared only on trees and shrubs, with the coralloid type predominating and the ball type occurring exclusively on the Betulaceae. (2) Ectendotrophic mycorrhizas were rare, appearing only on the roots of trees and shrubs. (3) Of the endotrophic forms, the peloton type was found most often and vesicles were also common, whereas arbuscules were rare. Endotrophic mycorrhizas were not observed in roots of trees or shrubs. (4) Pseudomycorrhizas appeared almost exclusively in the Pinaceae. Mycorrhizas were found on both humus and sandy soils. Except for those in the Orchidaceae, they appeared only in gymnosperms and dicotyledons, at elevations of 5,000-11,500 ft., and most abundantly at 7,500-10,500 ft.

Serological studies of the root-nodule bacteria.—II, Strains of *Rhizobium trifolii*, J. M. VINCENT (*Linn. Soc. N. S. Wales, Proc.*, 67 (1942), pt. 1-2, pp. 82-86).—A detailed serological study was made of 6 strains of *R. trifolii*, and tests with these and 32 other strains indicated that, as with *R. meliloti*, wider grouping is possible on a flagellar than on a somatic basis, the latter being more strain-specific. Twelve strains possessed neither of the *H* antigens postulated, but of these 4 gave *O* reaction. Eight strains, though reacting with the *A* type of flagellar antibody, failed to react with any of the sera for *O*. At least 10, probably 11, groups were recognizable, and of these the one reacting with *A, II*, was the largest clearly defined. In all, this group contained 10 strains collected from 5 plant species growing in widely separated areas. No relationship was evident between a host species and the serological grouping of the strain isolated from it.

Vitamin deficiencies of twelve fungi, W. J. ROBBINS and R. MA (*Arch. Biochem.*, 1 (1942), No. 2, pp. 219-220, fig. 1).—When *Ceratostomella* sp., *C. leptographioides*, *C. paradoxa*, *Chalaropsis thielavioides* (three isolates), *Polyporus versicolor*, *Pholiota adiposa*, *Stercum murrayi*, *Schizophyllum commune*, *Sclerotinia* isolates from *Opuntia* and eggplant, and *Claviceps purpurea* were grown in a basal mineral-dextrose medium plus asparagine and supplemented with thiamine, pyridoxine, and biotin singly and in all combinations, nine showed partial or complete deficiencies for one or more of the vitamins and

three showed no response to any of them but grew better in a malt medium than in the above basal medium.

Vitamin deficiencies of *Ceratostomella* and related fungi, W. J. ROBBINS and R. MA (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 835-843, figs. 3).—Of the 13 species of *Ceratostomella* tested with respect to thiamine, pyridoxine, and biotin, 11 suffered from complete or partial deficiencies for one or more of them and 6 grew markedly better in a basal medium supplemented with malt than with the three vitamins.

On the loss of vitamin B₂ from yeast during dissimilation, T. J. B. STIER and C. F. MACINTYRE (*Jour. Cell. and Compar. Physiol.*, 20 (1942), No. 3, pp. 385-392, figs. 2).

Polar and apolar transport of auxin in woody stems, J. OSERKOWSKY. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 858-866).—Nonresting woody apple and pear twigs often contain free-diffusible auxin; resting twigs rarely yield it in measurable amounts. In nonresting twigs the movement of such auxin in the direction of the long axis is mostly or entirely polar and basipetal. In resting twigs native auxin externally applied through agar blocks was transported basipetally but no measurable transport could be detected in the opposite direction. With indoleacetic acid similarly applied in varying concentrations, basipetal transport was evident in 26 of 34 tests; significant acropetal transport, in 6 of the 34. Translocation of the acid in sections of resting apple and pear twigs involves two simultaneous processes, polar and apolar transport, the former operating only basipetally and presumably via living cells. The polar transport which operates both basipetally and acropetally is probably a diffusion via cell walls and lumina of dead cells, but this process is modified by "fixation" or destruction of auxin along its diffusion path. Basipetal transport of indoleacetic acid and native auxin in these twigs takes place in both bark and wood. "Available evidence does not indicate that cambium accounts for the bulk of basipetal transport of auxin, if it is involved in it at all."

Comparative activity of synthetic auxins and derivatives, G. S. AVERY, JR., J. BERGER, and B. SHALUCHA (*Bot. Gaz.*, 104 (1942), No. 2, pp. 281-287).—The activities of indoleacetic, indolebutyric, naphthaleneacetic, dichlorophenoxyacetic, and naphthoxyacetic acids and certain derivatives were compared on desceded oats coleoptiles (both intact and decapitated). The detailed results are presented.

The effect of colamine on growth and protoplasmic streaming in *Avena*, B. M. SWEENEY (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 793-797, fig. 7).—As far as known, there is no substance in animals comparable to the plant auxins, but extracts of animal tissues contain substances inhibitory to growth of animal cells in tissue culture. One of these substances, colamine, was found to retard the rate of streaming on 4-day-old oats coleoptiles, but only at very high concentrations (1,000-10,000 mg. per liter). From the further data presented it is concluded that colamine acts by making temporarily unavailable a substance necessary to the action of auxin, possibly a 4-C acid.

Histological responses of *Vicia faba* to indoleacetic acid, B. F. PALSER (*Bot. Gaz.*, 104 (1942), No. 2, pp. 243-263, figs. 23).—Histologically, every parenchymatous tissue became active to some extent in the development of the tumor induced, vascularization of derived tissues was somewhat extensive, root induction was uncommon under the conditions imposed, and the occasional polyploid nuclei were somewhat more numerous in the treated stems. Detailed results are described. There are 28 references.

Auxin content of maize kernels during ontogeny, from plants of varying heterotic vigor, G. S. AVERY, JR., J. BERGER, and B. SHALUCHA (*Amer. Jour.*

Bot., 29 (1942), No. 9, pp. 765-772, figs. 5).—From Country Gentleman, Golden Cross Bantam, a number of pedigreed inbred and hybrid lines, and also from polyploid corn plants, the kernels were harvested at intervals during their development, free and precursor auxins were extracted by an alkaline hydrolysis method, and the extracts were assayed by the *Avena* technic. At pollination time the total auxin present in corn kernels was extremely small, but immediately after pollination the content increased very rapidly, a peak being reached in 1-3 weeks. From the peak to the dormant stage there was a marked drop in auxin content characteristic of all varieties studied. No relationship was apparent between vegetative vigor of hybrids and amount of auxin stored in their kernels. No fixed relationship was found between the amounts of precursor and free auxin, except that the former always constituted the major portion of the total obtainable at any one time. Corn kernels with sugary endosperm were consistently higher in total auxin than those with starchy endosperm. Exploratory experiments with immature kernels of diploid and tetraploid corn also failed to reveal any relationship between polyploidy and the amount of auxin stored in the kernels.

Auxin and calines in seedlings from X-rayed seeds, G. F. SMITH and H. KERSTEN (*Amer. Jour. Bot.*, 29 (1942), No. 9, pp. 785-791, figs. 5).—The detailed results here given of a study of the correlation between X-ray-induced modifications and the conditions of auxin and calines in darkroom-germinated pea seedlings from seeds given X-ray treatments appear to indicate that the general types of X-ray-induced structural modifications thus far described for plants can be explained on the basis of growth-factor destruction or transport inhibition. It is believed there is no evidence to date supporting the view that growth inhibitors are synthesized by X-ray irradiation.

Growth hormones as related to the setting and development of fruit in *Nicotiana tabacum*, R. M. MUIR (*Amer. Jour. Bot.*, 29 (1942), No. 9, pp. 716-720).—Direct measurements of diffusible growth substances on styles and ovaries showed considerable quantities in portions of a pollinated but very little or none in an unpollinated pistil, the concentration being closely related to the extent of penetration of the pollen tubes into the style and fertilization resulting in the release of large amounts in the ovary. These data are considered in relation to the hypothesis advanced to explain the initiation of fruit development by pollination. Extraction of pollen grains and pollen tubes did not indicate them to be the source of the growth hormones. It is suggested that pollen tubes may secrete an enzyme able to liberate growth substances from inactive combinations in the style and ovary. Growth substances released in the fertilized ovary move downward through the pedicel and prevent abscission of the pistil by inhibiting development of the abscission layer. They are also probably concerned in development of the conducting elements through which food materials move into the growing ovary. There are 19 references.

Species differences with respect to water absorption at low soil temperatures, P. J. KRAMER (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 828-832, figs. 2).—Studying collard, cotton, watermelon, sunflower, privet, elm, and red, white, loblolly, and slash pines, absorption was reduced in all, but more in species normally growing in warm soil than in those growing at least part of the year in cold soil. Species differences presumably result chiefly from low temperature effects on the viscosity and permeability of the root protoplasm. Reduction of water absorption from cold soil is of considerable ecological and practical importance, since it often produces winter injury and even affects the growth of greenhouse plants.

Relative drought resistance of seedlings of dominant prairie grasses, I. M. MUELLER and J. E. WEAVER. (Univ. Nebr. et al.). (*Ecology*, 23 (1942), No. 4, pp. 387-398, figs. 5).—In mixed plantings of 14 species tested at ordinary summer temperatures only a few plants—all short grasses—survived where drought was most critical. With the results of exposure to both soil and atmospheric drought considered, *Bouteloua gracilis* proved most resistant, other species in decreasing order of resistance being *Buchloe dactyloides*, *Bouteloua hirsuta*, *Sporobolus asper*, *B. curtipendula*, *Stipa comata*, *Andropogon scoparius*, *A. furcatus*, *Panicum virgatum*, *Sorghastrum nutans*, *Stipa spartea*, *Koeleria cristata*, *Elymus canadensis*, and *Agropyron smithii*. In general, species characteristic of uplands or normally occurring westward in mixed prairie were more resistant, and those in lowlands or true prairie less so.

On diurnal variations in the mineral content of the leaf of the cotton plant, E. PHILLIS and T. G. MASON (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 23, pp. 437-442, figs. 2).—When samples of leaves were collected over a 96-hr. period and their dry weights, water, and mineral contents determined, well-marked diurnal changes in all these values were found. These results are in harmony with the view that the mineral elements enter the leaf in the wood and (except for Ca) are exported from it into the phloem. Interpretation of the results is complicated by mineral losses caused by dew.

The use of radioactive phosphorus in translocation studies, R. N. COLWELL (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 798-807, figs. 9).—Methods described enable the rapid longitudinal movement of the radioactive P to be limited to the phloem and studied by radioautographs and the Geiger counter. Studies on the rate and direction of transport and the localization of radioactive P under various conditions showed that when this indicator is restricted to the phloem its movement is correlated with food movement in the plant. There are 20 references.

The unautolyzable protein of *Aspergillus sydowi*, N. BOHONOS, D. W. WOOLLEY, and W. H. PETERSON. (Wis. Expt. Sta.). (*Arch. Biochem.*, 1 (1942), No. 2, pp. 319-324).

Nicotine synthesis in excised tobacco roots, R. F. DAWSON. (Univ. Mo.). (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 813-815).—In contrast to all other organs, the roots were found to manufacture nicotine in appreciable amounts as growth occurred. The bulk thus produced was not retained within the roots but was excreted into the external medium where it accumulated. This completes the proof (E. S. R., 86, p. 605) for the localization of the nicotine synthetic mechanism in tobacco roots.

Physiological studies in plant nutrition.—XIII, Experiments with barley on defoliation and shading of the ear in relation to sugar metabolism, H. K. ARCHBOLD (*Ann. Bot. [London]*, n. ser., 6 (1942), No. 23, pp. 487-531, figs. 12).—In further studies of this general subject (E. S. R., 88, p. 171), ear shading and defoliation of barley grown under partial N deficiency were applied on four occasions at weekly intervals, the first at 60 and the last at 81 days after sowing. The treatments given were (1) defoliation, (2) defoliation plus flag-leaf sheath removal, (3) shading the ear, and (2) and (3) combined. The effects on stems and sheaths were confined to alterations in the sugar level, and there was no break-down of residual dry weight to supply assimilation deficiencies. Sugar levels are, therefore, the simple resultant of production and utilization of assimilate and are not complicated by production of sugar from insoluble reserves. Plants treated at low sugar levels failed to store sugar in the stems normally, but those treated at high sugar levels lost sugar at the normal rate. It is concluded that sugar stored in the stems and sheaths

is a reserve and not available for later conversion to starch in the ear, but it is lost from the stem by respiration and other metabolic processes not involving translocation.

Defoliation alone reduced the number of ears maturing but not the size of ear or grain. Early removal of the flag-leaf sheath reduced grain size, but late removal had no effect. The sugar level in the stem was greatly reduced by defoliation, and it is thus suggested that assimilation by the leaves is the source of stem sugar. Shading the ears reduced ear size but failed to affect the number produced. Stem sugars suffered only a small reduction, so that the shaded ears were able to utilize only a small part of the material which would otherwise have appeared as sugar in the stems. The carbohydrates of the ear are thus entirely supplied by directly assimilated material, translocated immediately from the various organs (calculated proportions given). Limitation of ear size by N shortage is believed to account for the small leaf contribution, the assimilate appearing instead as sugar, and leading to the high levels characteristic of N deficiency. If this is true, then the stems afford more accessible supplies of assimilate than the leaves. There are 22 references.

Influence of oxygen tension on respiration, fermentation, and growth in wheat and rice. D. L. TAYLOR (*Amer. Jour. Bot.*, 29 (1942), No. 9, pp. 721-738, figs. 9).—In the absence of O_2 , germination in rice was reduced less than 10 percent below that in air and occurred at more than half the normal rate, but wheat failed to germinate at all. Manometric measurements indicated that when the respiration rate was expressed in terms of CO_2 evolved per milligram of dry weight of embryo per hour, intact rice seedlings had 87 percent as great activity in air as wheat seedlings. However, per seedling in air, the CO_2 output of rice was 48 percent as rapid as that of wheat. Oxygen uptake by both was partially inhibited by sodium azide and CO , indicating at least a partial dependence on cytochrome oxidase. In absence of O_2 , rice seedlings evolved CO_2 1.5 times as rapidly as in air; wheat, only about 50 percent. It may be concluded that the superiority of rice over wheat in ability to germinate and grow in very low O_2 tensions depends on its possession of a highly functional fermentation system which more than compensates for a respiration system even weaker than that of wheat.

Meyerhof quotients pointed to a strong Pasteur effect in rice and a very weak one in wheat. Calculations indicated that for every hexose molecule used in respiration by rice seedlings, about four hexose molecules that would have been destroyed in the absence of O_2 were preserved as respirable substrate. With reduction in O_2 tension there appeared to be a rapid decrease in rate of total energy liberation, so that under complete anaerobiosis the rate for rice was one-sixth that in air and the rate for wheat one-fifteenth that in air. Under low O_2 concentrations, where rice exhibited greater germination and growth than wheat, it also liberated more energy in fermentation. It is suggested as possible that, in promoting growth, energy released anaerobically in fermentation may be more efficiently used than energy liberated in oxidative respiration.

Using excised parts of wheat and rice seedlings, it was found that 65-85 percent of the total CO_2 output at any O_2 tension was contributed by the embryo. The endosperm in rice made up a larger fraction of the weight of the seed than in wheat, and it accounted for a correspondingly higher percentage of the total CO_2 evolution. Growth studies indicated that rice is more tolerant of alcohol than wheat. Some utilization of alcohol as a substrate for aerobic respiration was noted in both seedlings. Certain implications as to substrate utilization and effects of metabolic products are briefly discussed.

The methods used are described, and detailed results are presented. There are 59 references.

Photosynthesis and respiration in sugar beet as influenced by the staple element of root nutrition, G. P. USTENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 32 (1941), No. 9, pp. 658-660*).—When leaves on the plant were wetted with solutions of nutrient salts the photosynthetic rate was in all cases increased, N proving most effective when applied during the period of intensive leaf formation and K when sugar was accumulating most rapidly in the root. Using the same salts, injection of solutions of NH_4NO_3 and $\text{Ca}(\text{H}_2\text{PO}_4)_2$ solutions into severed leaves or immersing the petioles therein favored photosynthesis, whereas KCl caused a considerable reduction. Only in attached leaves did KCl favor photosynthesis; in detached leaves the reduction therein was greater with increase in amount of salt applied. When the other salts were present in sufficient amounts (as in attached leaves), KCl increased the photosynthetic rate. Wherever photosynthesis increased from wetting the leaves with nutrient salt solutions the yields were also augmented, though not in direct proportion.

Some effects of the drug colchicine on cell division, J. G. HAWKES (*Jour. Genet., 44 (1942), No. 1, pp. 11-22, pl. 1, figs. 3*).—In onion seedlings the spindle mechanism was inhibited by colchicine during mitosis but recovered its normal function after mild treatment. The only cytological effect was apparently on those stages where the spindle would normally be present. The number of restitution nuclei in a root gave a direct indication of how many cells had divided while under the influence of the drug. Cells which had passed through more than one division under colchicine influence proved incapable of many further divisions, since the resulting plants never possessed more than double the normal number of chromosomes. The division cycle was about twice as long as normal under otherwise similar conditions. The subterminal root swellings are shown to be due to a lack of polarity in the diploid cells behind the root tip. Instead of growing longitudinally the maturing cells do so in all directions, their volumes remaining roughly the same as those of cells in untreated roots. It is also indicated that a similar effect of subterminal root swelling is induced by heteroauxin and that neither colchicine nor heteroauxin can produce such swellings if the root tips are removed.

Chromosomal effects of low X-ray doses on five-day *Tradescantia* microspores, L. D. MARINELLI, B. R. NEBEL, N. GILES, and D. R. CHARLES. (N. Y. State Expt. Sta. et al.). (*Amer. Jour. Bot., 29 (1942), No. 10, pp. 866-874*).

Electron micrographs of protein molecules, W. M. STANLEY and T. F. ANDERSON (*Jour. Biol. Chem., 146 (1942), No. 1, pp. 25-30, pls. 2*).—Preparations of five proteins and of a mixture of tobacco mosaic virus and silver particles were examined under an electron microscope. The estimated diameters of some of the silver particles were about 15 a. u. Molecules of bushy stunt virus and the hemocyanin of an arachnoid (*Limulus*) appeared to be essentially spherical with diameters of about 26 and 20 μ , respectively. Micrographs of mollusk hemocyanin (*Busycon* and *Viviparus*) showed particles averaging about 22 and 29 μ , respectively. From the low contrast of these particles in the electron microscope and consideration of ultracentrifuge data, it is inferred that the molecules of these two hemocyanins are probably platelike in shape. A micrograph of edestin (crystalline protein from certain seeds) exhibited many particles ranging up to about 11 μ in diameter and an almost complete absence of larger particles. There are 17 references.

The three-dimensional shapes of undifferentiated cells in the petiole of *Angiosperm*, N. HIGINBOTHAM. (Tex. Expt. Sta.). (*Amer. Jour. Bot.,*

29 (1942), No. 10, pp. 851-858, figs. 16).—The observational and other data presented are discussed in relation to the theory that surface film forces predominate in determining cell shapes.

Vascular differentiation in the vegetative shoot of *Linum*.—I, The procambium, K. EBAU. (Univ. Calif.). (*Amer. Jour. Bot.*, 29 (1942), No. 9, pp. 738-747, figs. 29).—This section presents the detailed results of a morphological and cytological study of procambium development in perennial flax. There are 21 references.

On the development of xylary elements in the first internode of *Avena* in dark and light, R. H. GOODWIN (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 818-828, figs. 7).—In oats, the rate of formation of spiral and particularly of pitted elements was greatly increased by exposures to visible light, pronounced effects being observed as early as 12 hr. after weak irradiations. The close correlation between light inhibition of elongation of the first internode and formation of pitted xylary elements which are incapable of growth in length is brought out, and the possible role of the xylem as an important cog in the light inhibition mechanism is discussed.

GENETICS

Variations in chromosomal association and behavior during meiosis among plants from open-pollinated populations of *Dactylis glomerata*, W. M. MYERS and H. D. HILL. (U. S. D. A. et al.). (*Bot. Gaz.*, 104 (1942), No. 1, pp. 171-177).

Linkage relations of the Goldfoil factor for resistance to mildew in barley, F. N. BRIGGS and E. H. STANFORD. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 66 (1943), No. 1, pp. 1-5).—In a cross between the awned and hulled Goldfoil barley, carrying the Goldfoil factor (MI_9) for resistance to mildew, and Nepal 595, which carries the contrasting characters, mildew resistance was found linked with hooded (K) 18.77 ± 2.33 percent and with Bl for blue aleurone with a crossover of 26.31 ± 5.05 percent. As Robertson et al. (*E. S. R.*, 67, p. 375) had shown previously, K and Bl are linked with a value of 22.58 ± 0.82 percent. These factors have been assigned to linkage group IV. The order suggested is Bl, K, MI_9 . Red stem color in this cross, found due to a single factor R_s , was linked with hulled (N), 14.50 ± 1.06 percent and with a second factor for blue aleurone (Bl_1) with a cross-over value of 9.07 ± 1.24 percent. These genes were assigned to linkage group III and the suggested order is N, Bl, R_s .

The developmental relationship between shoot apex and growth pattern of leaf blade in diploid maize, E. C. ABBE, L. F. RANDOLPH, and J. EINSET. (Univ. Minn., U. S. D. A., and Cornell Univ.). (*Amer. Jour. Bot.*, 28 (1941), No. 9, pp. 778-784, figs. 5).

The effects of translocation on growth in *Zea mays*, L. M. ROBERTS. (Conn. [New Haven] Expt. Sta. et al.). (*Genetics*, 27 (1942), No. 6, pp. 584-603, figs. 2).—The 13 reciprocal translocations, identified cytologically in an inbred line of Connecticut 20 corn following pollen irradiation with 1,000 r-units, involved all chromosomes except chromosomes 7 and 9. Comparison of homozygous and heterozygous progenies of the 13 translocations in a replicated field test with the normal untreated inbred from which they were derived revealed no conspicuous phenotypic changes. Significant small differences, relatively infrequent, were found by statistical study of several plant characters. Recessive mutations did not adequately account for all the changes found.

Convergent improvement with four inbred lines of corn, R. P. MURPHY. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 138-150).—By convergent improvement, marked gains could be made in the recovered lines in vigor, in resistance to smut and lodging, and in soundness of the ear in instances where the original lines lacked these characters. Most recovered lines yielded significantly higher in crosses to the recurrent parent than the original recurrent parent. Some recovered lines yielded as well as the original F_1 cross when tested in crosses with the nonrecurrent parent. Performances of the recovered lines when crossed to the recurrent and nonrecurrent parents, respectively, were not related. No difference was apparent in the performance of the recovered lines from 2-, 3-, and, in the one instance, the 4-yr. backcrosses. Single crosses between recovered lines which yielded higher than the original F_1 cross could be obtained. Chances of obtaining high-yielding crosses were greatest when recovered parental lines had been high or intermediate in combining ability as measured by their yield in crosses to the nonrecurrent parent.

Genetics of self-compatibility in *Trifolium repens*, S. S. ATWOOD. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 4, pp. 353-364).—While most white clover plants are relatively self-incompatible, one found in 1938 averaged over 100 seeds per head, and this high seed set was duplicated on clones from this plant by hand-pollination and by bee-pollination. This plant was crossed with a self-incompatible plant, and 14 F_1 plants diallely intercrossed and backcrossed to both parents. Two intrasterile, interfertile groups of 5 and 6 plants, respectively, found in this F_1 population were reciprocally compatible with both parents but all relatively self-incompatible. The other 3 F_1 plants were cross-compatible with both F_1 groups, with both parents, and with each other, and were also self-compatible. The results were explained by postulating that the original self-compatible parent was heterozygous for a self-compatibility factor (S_r), which is a member of the multiple allelic series conditioning self- and cross-incompatibility, and that this factor was transmitted to the 3 self-compatible F_1 plants. See also earlier notes (E. S. R., 86, pp. 26, 174).

The aid of exploration in potato improvement, H. G. MACMILLAN. (U. S. D. A.). (*Amer. Potato Jour.*, 19 (1942), No. 12, pp. 255-266).

Inheritance of growth habit, cotyledon color, and cup-leaf in *Melilotus alba*, E. E. HARTWIG. (Ill. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 2, pp. 160-166, fig. 1).—Growth habits of F. C. 13074 and of the dwarf-branching segregate of F. P. I. 89911, leafy, short, fine-stemmed types of biennial white sweetclover, were inherited as simple recessives to the common growth type. The respective genes found to determine the dwarf-branching character in these types were designated as d_1 for Alpha, d_2 for F. C. 13074, and d_3 for F. P. I. 89911, and d_2 for the bunch dwarf of Clarke (E. S. R., 65, p. 325). Yellow cotyledon color, I , behaved as a simple dominant to green cotyledon, i , but the F_1 cotyledon color usually resembles that of the maternal parent and apparently is affected by environment. Cup-leaf was determined by a single gene, c , recessive to normal leaf, C . The genes i , c , and d_2 are inherited independently.

Inheritance of seed color in biennial white sweet clover, *Melilotus alba*, S. P. SWENSON. (S. Dak. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 452-459).—Occurrence of normal yellow, pale yellow, pale green, and green seed colors in biennial white sweetclover (E. S. R., 82, p. 180) could be attributed to different combinations of two independent gene pairs. C is necessary for color production in the seed coat, cc plants having colorless seed coats. Y produces yellow and y green cotyledons, regardless of seed coat color, although

in the presence of *C* the yellow or green color also develops in the seed coat. Seeds with colorless seed coats and yellow cotyledons (*cY*) are pale yellow; those with colorless seed coats and green cotyledons (*cy*) cannot be distinguished from normal green by ordinary visual examination. Normal v. dwarf habit of growth in green \times pale yellow are differentiated by a single gene pair independent of the two genes for seed color. The heterozygotes were intermediate in growth habit.

Further studies on interspecific genetic relationships in *Lactuca*, R. C. THOMPSON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 66 (1943), No. 1, pp. 41-48, fig. 1).—A total of 69 crosses was attempted between 8-chromosome species and between species with 8, 9, or 17 chromosomes. Hybrids were obtained in only 8 of the 44 interspecific matings, and of these all were sterile except those from a cross between the 8-chromosome species *L. bourgaci* \times *L. marschalli*. Further evidence (E. S. R., 86, p. 176) was obtained that the *L. scariola* group, to which the cultivated lettuce belongs, constitutes a compatibility group not closely related to the other groups of lettuce species studied. The successful crossing of certain 8- and 9-chromosome species, although resulting in sterile hybrids, indicated that the 17-chromosome species may have arisen from hybrids of 8- and 9-chromosome parents.

Diploid-tetraploid periclinal chimeras as bud variants in citrus, H. B. FROST and C. A. KRUG. (Calif. Citrus Expt. Sta. et al.). (*Genetics*, 27 (1942), No. 6, pp. 619-634, figs. 12).—Studies of a bud variant which arose on a hybrid citrus tree (King \times Dancy) suggested that the variant owed its peculiar characters to the occurrence of somatic chromosome duplication and had produced buds of at least two types of cytological constitution, both of which were periclinal chimeras.

Chromosome number in the progeny of triploid *Gladiolus*, with special reference to the contribution of the triploid, R. E. JONES and R. BAMFORD. (Md. Expt. Sta.). (*Amer. Jour. Bot.*, 29 (1942), No. 10, pp. 807-813, figs. 12).—The results are presented of chromosome counts on 460 plants obtained from pollination of triploid forms with diploids and tetraploids. The range of the somatic chromosome numbers in the progeny was from 33 to 88.

[**Papers on animal genetics**] (*Genet. Soc. Amer. Rec.*, 11 (1942), pp. 75, 76-77, 78, 79-80, 80-81, 87-89, 92, 95-96).—Brief abstracts are presented of the papers that were to have been presented before the Genetics Society of America at the 1942 meeting in New York: New Extreme Variants in a Selection Experiment, by H. D. Goodale (p. 75); Frequencies of Seven Dominant Genes in Natural Populations of *Platyopercilus maculatus* and Experimental Evidence of a Multiple Allelic Series, by M. Gordon (p. 76); Genetic Constitution of the Mother as a Means of Predetermining the Sex of the Progeny, by J. W. Gowen and R. H. Nelson (p. 76) (Iowa State Col.); A Possible Case of Directed Mutation in the Pigeon, by W. F. Hollander (pp. 76-77); A Critical Test of Strains of Fowls Bred for Resistance to Lymphomatosis, by F. B. Hutt, J. H. Bruckner, R. K. Cole, and R. F. Ball (p. 77) (Cornell Univ.); Heterogeneity in the Lethal Mutation Rate Within a Wild Population of *Drosophila melanogaster*, by P. T. Ives (p. 77); Spleen Transplantation Relationships Among Two Inbred Lines of Mice and Their F_1 Hybrid, by N. Kaliss and T. Robertson (p. 78) (Cornell Univ.); Genetic Resistance to Deficiency of Riboflavin in the Chick, by W. F. Lamoreux and F. B. Hutt (pp. 79-80) (Cornell Univ.); The Failure of Selection to Modify Shank-Growth Ratios of the Domestic Fowl, by I. M. Lerner (pp. 80-81) (Univ. Calif.); A Skeletal Difference Between Reciprocal F_1 Hybrids From a Cross of Two Inbred Strains of Mice, by W. L. Russell and E. L. Green (p. 87) (Ohio State Univ. et al.); A Quantitative Histological Study of

Genic Effects on Coat Color in the House Mouse, by E. S. Russell and W. L. Russell (pp. 87-88); **Inheritance of "Atropinesterase," A Blood Enzyme of the Rabbit**, by P. B. Sawin and D. Glick (p. 88); **Differences in the Social Organization of Mice Caused by Differences in Social Behavior (Fighting of Males)**, by J. P. Scott (pp. 88-89); **Marcelled, A New Recessive Mutation Affecting the Coat of the House Mouse**, by A. G. Steinberg and F. C. Fraser (p. 92); and **"Misty," A New Coat Color Dilution in the Mouse, *Mus musculus***, by G. W. Woolley (pp. 95-96).

Are pedigrees important? D. G. STEELE. (Univ. Ky.). (*Blood-Horse*, 38 (1942), No. 19, pp. 574-577).—Studies of the two-line pedigrees by the sampling methods of Wright and McPhee (E. S. R., 54, p. 324) of breeding methods and relationship of stake winners and beaten Thoroughbred horses in 1935, 1940, and 1941 showed only minor ancestral differences. The breeding methods followed in the Thoroughbred horse were similar to those found in other classes of farm animals. The importance of performance and ancestors in the first and second generations is emphasized.

Cross-breeding of chinchillas, G. M. BRUN (*Amer. Fur Breeder*, 15 (1942), No. 5, pp. 20, 22, 26, fig. 1).—Progress was made in the development of chinchillas of improved quality and vigor by crossing the more hardy type *Brevicaudata*, found at high altitudes, with the *Lanigera* type which was more capricious but showed certain desired qualities and was found at lower altitudes.

Breeding chickens for meat production, V. S. ASMUNDSON, and I. M. LEENER (*California Sta. Bul.* 675 (1942), pp. 45, figs. 10).—In this companion to Bulletin 626 (E. S. R., 80, p. 472), the inheritance of meat production characters is reviewed. The efficient breeding program comprises recognition of individuals capable of transmitting superior qualities to their progeny. Special attention is given to literature on market requirements for meat birds, growth rates, and quality of edible meat, cross-breeding, feathering, colors, and sex-linkage in the inheritance of these qualities.

The role of breeding in the control of fowl paralysis, F. P. JEFFREY, F. R. BEAUDETTE, and C. B. HUDSON (*New Jersey Stat. Bul.* 696 (1942), pp. 4).—The percentage of paralysis and laying house mortality occurring in a line of Single-Comb White Leghorns selected and inbred for freedom from fowl paralysis was reduced from 33 and 84 percent in 1934 to 3.5 and 27 percent, respectively, in 1940. At the same time in a line selected for a high incidence of paralysis the percentage of paralysis decreased from 29.8 to 10.1 percent, and the laying house mortality from 80 to 41 percent. If the difference in reduction is attributed to breeding, three-fourths of the reduction in incidence must be attributed to other than breeding factors.

Restitution of the tail in the early chick embryo, E. ZWILLING. ([Conn.] Storrs Expt. Sta.). (*Jour. Expt. Zool.*, 91 (1942), No. 3, pp. 453-463, figs. 6).—The studies reported have shown the removal of the entire tail anlage from 17- to 27-somite chick embryos to result in the absence of the tail. "When a portion of the undifferentiated tissue of the anlage remains there is a restitution of the tail in a large percentage of the cases. This is probably due to the totipotency of the cells comprising the tail thickening. Deletions of all or part of the primitive streak from 11- to 14-somite embryos may result in tail restitution, probably as a consequence of continued tissue movements. Earlier stages may have this capacity, but the present technic does not allow for a proper demonstration."

Germ cell studies in the male fox (*Vulpes fulva*), D. W. BISHOP (*Anat. Rec.*, 84 (1942), No. 2, pp. 99-115, pls. 4).—The diploid chromosome number in

the silver fox was found to be 32, which included a small Y and larger X chromosome in the ♂. Study was made of testicular material from 17 1-5-year-old silver foxes, *V. fulva*. Details of the germ cell formation and chromosome behavior are described.

A study on spermatogenesis in rats, E. CUTLY (*Amer. Jour. Physiol.*, 137 (1942), No. 3, pp. 521-526, figs. 8).—Three groups of rats hypophysectomized at different ages showed that no spermatozoa developed when the operation was performed before day 29, and many tubules revealed degenerative changes after this age, although some sperm formed. It appeared that testosterone propionate was injurious to gamete formation. In some way the germ cells became detached from the tubular epithelium and were transported to the epididymus where they degenerated. On the other hand, treatment of such animals with pregnant mare serum induced tubular development and sperm formation. When hypophysectomized after 29 days, sperm developed in animals treated with the androgen and the gonadotropins, but with testosterone treatment there was sloughing and degeneration in the seminiferous epithelium and epididymis. Damage from androgen was less when hypophysectomized between 35 and 44 days of age.

Increase in weight of gonads following injection of single male rat pituitary, R. P. REECE and E. J. WEATHERBY. (*N. J. Expt. Stas.*). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 218-219).—The ovaries of 24- to 26-day-old rats and the tests of day-old White Leghorn chicks showed average increases of 309 and 62 percent, respectively, following eight divided doses of ♂ rate pituitary over a 4-day period.

Induction of male copulatory behavior in a hen following administration of male hormone, A. ZITLIN (*Endocrinology*, 31 (1942), No. 6, p. 690).—Copulatory behavior was induced in a pullet following the implantation of a testosterone pellet. The hen afterward laid eggs at least one of which proved fertile.

Fetal survival following the injection of Antuitrin-S in pregnant rats and rabbits, R. M. COCO. (*La. State Univ.*). (*Amer. Jour. Physiol.*, 137 (1942), No. 1, pp. 143-145).—Injection of pregnant rats and rabbits during late pregnancy with varying doses of Antuitrin-S (40-200 rat units) usually resulted in death of the fetuses in utero or soon after parturition. The ovaries usually contained induced corpora lutea, but these evidently did not reach a threshold level of secretion. The study was based on 86 rats and 16 rabbits injected by methods previously described (*E. S. R.*, 83, p. 758).

Hormone-induced ovulation in domestic fowl, R. M. FRAPS and G. M. RILEY. (*U. S. D. A.*). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 253-257).—By the intravenous administration of a luteinizing preparation after pretreatment with pregnant mare serum, multiple ovulations were induced in the hen. Ovulation occurred in 24 of 26 hens 22 hr. after the luteinizing hormone injections, as ascertained by the presence of single-yolked eggs in utero. None of 8 control hens injected only with pregnant mare serum had eggs in their oviducts. On second injection with luteinizing hormones 22 hr. after the first, 7 of the 26 hens showed eggs in utero 24 hr. later. When the group of hens that ovulated were again injected with 20 units of luteinizing hormone 3 days later, 8 eggs were shown to be in utero 24 hr. later. Eggs were not present in utero of those hens not injected with luteinizing hormone, and none showed evidence of previous ovulations. In another experiment all of 16 hens pretreated with pregnant mare serum were caused to ovulate an average of 3.5 times per hen. These hens were pretreated with 6-11 daily doses of 100 rat units of the pregnant mare serum, but when 20 rat units were used only 13 of 16 hens ovulated.

Effects of a series of steroids on ovulation and reproduction in pigeons, H. H. DUNHAM and O. RIDDLE (*Physiol. Zool.*, 15 (1942), No. 3, p. 383-395, pl. 1).—In studies of ovulation in the fowl extending those of Phillips and Warren (*E. S. R.*, 77, p. 770), the action of a series of steroids on ovulation, oviposition, and eggshell formation in the ringdove and common pigeon was investigated. Doses of desoxycorticosterone acetate, ranging from 0.05 to 2.25 mg., injected in 43 ringdoves, and 0.05–0.5 mg. of progesterone in 20 birds, tended to prevent normal ovulations. Controls received sesame oil or propylene glycol, the solvents used without noticeable effect. All steroids injected at 5–36 hr. before ovulation delayed or prevented ovulation, but higher concentrations of oestradiol benzoate, oestrone, dehydroandrosterone, and androsterone were required in over 150 tests.

Frozen plant juice as the source of a rabbit ovulating factor, R. BORASKY and J. T. BRADBURY. (U. S. D. A.). (*Amer. Jour. Physiol.*, 137 (1942), No. 3, pp. 637–639, fig. 1).—Oat juice collected at different times during the growing season retained its ovulating potency in the rabbit for at least 21 mo. in the frozen condition. The rabbit was variable in its responsiveness in different seasons, and little response was induced during the late summer.

Copulatory behavior in prepuberally castrated male rats and its modification by estrogen administration, F. A. BEACH (*Endocrinology*, 31 (1942), No. 6, pp. 679–683, fig. 1).—The daily administration of oestrogen for 6 days to ♂ rats castrated at 21–23 days of age increased the frequency of responses to receptive ♀s after 100 days. Some copulatory activity was noted prior to the administration of the hormone.

Male and female mating behavior in prepuberally castrated female rats treated with androgens, F. A. BEACH (*Endocrinology*, 31 (1942), No. 6, pp. 673–678, figs. 3).—Incomplete masculine responses exhibited by prepuberally castrated ♀ rats were increased 95 percent by the injection of testosterone propionate, and a greater portion of complete copulatory pattern responses was exhibited. No receptive behavior was exhibited by normal ♂s before androgen administration, but after treatment lordosis appeared in 4 rats and/or characteristic ♀ mating responses were exhibited. The study was conducted with 10 ♀ rats castrated at 21–27 days of age and raised in segregation with tests of copulatory responses on alternate days between the ages of 35 and 67 days. Each ♀ received a total of 24 mg. of androgen over a period of 2 weeks.

Exploratory study of early effects of urinary gonadotropin in prepuberal male rats, E. Z. BURKHART. (Univ. Ark.). (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 152–153).—Antuitrin-S administered in the form of single or double doses totaling 20 rat units caused an increase in mitotic activity in the ventral prostate and seminal vesicles. Mitotic activity was arrested by colchicine. The single dose was as effective in the 20 rats injected when tested up to 44 hr. after the first injection.

Presence of estrogenic hormone(s) in testicular material, B. CUNNINGHAM, J. MAY, and S. GORDON (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 130–132).—Essays of deer testes showed the presence of oestrogens in greater concentrations than were found in bull testes. The assays were conducted with ovariectomized rats.

The oviduct and egg transport in the albino rat, R. H. ALDEN (*Anat. Rec.*, 84 (1942), No. 2, pp. 137–169, pls. 4).—The entrance of the egg into the oviduct of the rat is effected primarily by the action of cilia, while further progress is governed by muscular contraction. These conclusions were based on observations by transillumination of oviducts of 30 rats containing artificially introduced material and fertilized and unfertilized ova. The histological changes in the

oviduct with the sex cycles and egg transportation and cilia formation and structure are described.

A case of extrauterine pregnancy in the rabbit, M.-D. F. NUTTING (*Anat. Rec.*, 84 (1942), No. 2, pp. 215-219, fig. 1).—A case of extrauterine pregnancy was found in the rabbit with the discovery of a 29-day-old fetus with normal hair growth and another of about half the size. The fetuses were attached with blood supply through the mesentery along the small intestine and the omentum.

Actions of sex hormones on oestrous cycle and reproduction of the golden hamster, O. PECZENIK (*Jour. Endocrinol.*, 3 (1942), No. 2, pp. 157-167, pl. 1).—Study of the oestrous cycles and the effects of gonadotropic injections on 76 normal and castrated hamsters showed that typical vaginal smears were produced by moderate or large doses of gonadotropins spread over several days, as well as in the pregnant hamsters and those treated with progesterone. Anterior pituitary gonadotrophin injections inhibited the oestrous cycle, whereas large doses caused sterility. Moderate doses of stilboestrol or chorionic gonadotropin induced ovulation, and pregnancy followed in sterile ♀s which were less than 10 mo. of age. No litters lived more than a few days when the treated ♀s were older.

The method of growth of the follicle and corpus luteum in the mouse ovary, W. S. BULLOUGH (*Jour. Endocrinol.*, 3 (1942), No. 2, pp. 150-156, pl. 1, fig. 1).—Further survey of the above data suggests that cells other than the follicle and corpus luteum are affected by the presence of high concentrations of oestrogen in the follicular fluid.

An androgenic substance in feces from cattle as demonstrated by tests on the chick, G. M. RILEY and J. C. HAMMOND. (U. S. D. A.) (*Endocrinology*, 31 (1942), No. 6, pp. 653-658).—Comb growth in chicks was stimulated by the inclusion in the ration of 10 percent dried feces from pastured cows and heifers, whereas there was no effect from bull feces or feces from cows not having access to pasture. Growth of the gonads of ♂ and ♀ chicks was retarded by diets containing androgen. Both alcohol and chloroform extracts of the cows' feces had androgenic activity, but when the alcohol concentration was increased to 80 percent it was without effect. A chloroform extract of 1 gm. of dried feces probably had somewhat more androgenic activity than 16 µg. of testosterone acetate. Feces from mature bulls were without effect on comb growth or gonadal development. The study was conducted in three experiments with 6, 8, and 6 lots of 25 chicks each. There were included testosterone acetate additions as well as the extracts of the feces.

Progesterone effect on pituitary lactogen content and on mammary glands of ovariectomized rats, R. P. REECE and J. A. BIVINS. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 582-584).—The daily subcutaneous administration of progesterone to spayed rates increased the lactogen content of the pituitary through an increase in hormone concentration, but no significant difference from untreated controls was noted in the pituitary weight. When oestrogen was administered separately or with progesterone, there was further increase in the lactogen production and the pituitary weight was increased. The study was based on pituitaries of spayed ♀ rats treated for 10 days with 15 mg. of progesterone or 33γ of oestradiol benzoate, or a combination of the two in comparison with controls. Lactogen was ascertained in bird units (E. S. R., 85, p. 332).

Effect of estrone on lactogen content in pituitary and blood of male rabbits, J. MEITES and C. W. TURNER. (Univ. Mo.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 190-193).—The daily injection of ♂ rabbits with 50, 100, and 500 I. U. of estrone caused a considerable increase in

the lactogen in the pituitaries and blood stream but not so much with the higher levels as with the lower levels of injection. A very definite increase of lactogen in the blood stream was associated with increased amounts of lactogen in the pituitary.

Mammary gland growth in hypophysectomized castrated guinea pigs, E. T. GOMEZ. (U. S. D. A.). (*Endocrinology*, 31 (1942), No. 6, pp. 613-618, figs. 9).—Growth of the duct system of the mammary gland of hypophysectomized castrated ♂ and ♀ guinea pigs was induced by injecting extracts, or implantations, of 20-50 mg. of fresh anterior hypophyseal gland tissue from adult ♂ and ♀ animals. The extracts were injected over a 10-day period and the minimum effective dose was 20 mg. of the tissue or extracts of this amount. Slight duct growth was induced by lactogenic hormone injections, but it was improved by simultaneous injection with oestrogen. Lactogenic extracts with an alcohol-ether mixture were mammogenically inactive. The studies were conducted with 44 hypophysectomized gonadectomized guinea pigs of both sexes injected with steroid hormones, extracts, or implantations of the anterior hypophyseal gland.

Lactogenic content of pituitaries of pseudopregnant rabbits, J. MEITES and C. W. TURNER. (Univ. Mo.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 193-194).—The normal mature rabbit, the pseudopregnant rabbit, and the pregnant rabbit all were found to contain about 10 R.-T. units of lactogen per pituitary gland. The study was conducted by methods previously described by Reece and Turner (*E. S. R.*, 78, p. 323).

Assay of adrenals for lactogenic hormone, V. HURST, J. MEITES, and C. W. TURNER. (Univ. Mo.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 4, pp. 592-594).—Assays for lactogen by the intradermal (micro) pigeon crop test (*E. S. R.*, 85, p. 607) showed that two commercial adrenal cortical extracts, whole untreated rabbit adrenal glands, and isoelectric precipitates of beef, hog, and rabbit adrenals did not cause the production of significant amounts of lactogen in the pituitaries. The study was conducted with 105 treated pigeons in groups of about 10 with each extract.

Effect of adrenalectomy on the lactogenic hormone and initiation of lactation, J. MEITES, J. J. TRENTIN, and C. W. TURNER. (Mo. Expt. Sta.). (*Endocrinology*, 31 (1942), No. 6, pp. 607-612).—In 33 ♀ rats, adrenalectomy reduced the lactogen content of the pituitaries about 27 percent on a body weight basis. When 1,000 I. U. of oestrone were administered to 10 normal rats, there was an increase in the lactogen production of the pituitaries of 216.9 percent of normals, and 104.5 percent increase in the lactogen production by adrenalectomized rats to which oestrone was administered. The lactogen content of the pituitaries of rats adrenalectomized during the last week of pregnancy did not differ from normal, but lactation was at a lower rate after parturition and about half of the young were dead 2 days later though milk was present in the stomachs. It appeared that removal of the adrenals was followed by decreased secretion of pituitary gonadotropins, causing reduced oestrogen secretion and thus reduced lactogen production by the anterior pituitary. The experimental results were obtained with 111 albino and hooded ♀ rats averaging 188 gm. in body weight with autopsy about 7 days later. Lactogen assays were made by the pigeon crop method (*E. S. R.*, 78, p. 324). Similar results were obtained with 29 ♂ and ♀ guinea pigs.

Lactogenic hormone prolongs the time during which deciduomata may be induced in lactating rats, R. LYON. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 156-157).—Evidence of corpus luteum stimulation by the lactogenic hormone in 13 of 15 rats from the twentieth to twenty-fourth postpartum day is presented. Microscopical deciduomata, together with

robust appearing corpora lutea, were present after four daily treatments with lactogenic hormone.

Effect of thyroidectomy, castration, and replacement therapy on thymus, lymph nodes, spleen in male rats, W. O. REINHARDT and P. WAINMAN. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 49 (1942), No. 2, pp. 257-260).—An interrelationship between the thyroid, thymus, spleen, lymph nodes, and the testes of rats was demonstrated in 4 main groups of 60-day-old ♂s consisting of unoperated normals, castrates, thyroidectomized, and castrated thyroidectomized animals. Subgroups of about 10 each were given thyroxin or testosterone propionate, or kept as controls without further treatment. In general, castration alone or in combination with thyroxin caused definite increases in the weights of the thymus, lymph nodes, and spleen. Thyroidectomy alone reduced the weights of the thymus and spleen to a small extent. Testosterone propionate administration prevented the increases in weights following castration. Histological study showed the tissues to be graded in the order of decreasing responsiveness as thymus, cervical lymph nodes, mesenteric lymph nodes, and spleen. Changes in the thymus were correlated with changes in the other tissues.

FIELD CROPS

[Field crops research in wartime in Arkansas]. (Partly coop. U. S. D. A.). (*Arkansas Sta. Bul.* 428 (1942), pp. 6-12, 46-47).—Investigations with field crops and related lines (E. S. R., 88, p. 40) making useful contributions during the current emergency and reported on briefly by C. K. McClelland, J. O. Dockins, D. B. Shank, and R. P. Bartholomew included variety experiments with corn and hybrids, oats, barley, wheat, rice, peanuts, and soybeans for seed and hay; relative performance of corn varieties and hybrids on soils of different levels of fertility; use of barley to replace all or part of the corn used for feed in Arkansas; breeding work with oats, rice, soybeans, and longer staple cotton adapted to mechanical picking; spacing tests with peanuts; value of green manure to replace N fertilizers and effects on yield of corn, rice, and cotton; relative merits of crop rotation and superphosphate on yields of oats, wheat, clover, and corn; and factors affecting adaptation of soybean production on cotton farms for oil mills.

Michigan crops for 1943, H. C. RATHER (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 203-208, figs. 3).—Special considerations mentioned as confronting Michigan farmers in 1943 include varieties of corn, oats, barley, field beans, soybeans, and potatoes; fertility needs and cultural practices for beans, soybeans, and forage crops; potato fertilizers; and labor needs for potatoes and sugar beets.

[Field crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 1, pp. 2-3, 6, 7).—Articles of current interest are entitled More Peanuts Needed—Survey Reveals Cause Low Yields, Means of Increasing, by F. J. Welch (pp. 1, 7); and Yields of Corn Hybrids and Varieties at Hill Stations, by W. H. Freeman (pp. 2-3, 6).

[Field crops research in Oklahoma, 1940-42]. (Partly coop. U. S. D. A. et al.). (*Oklahoma Sta. Bien. Rpt.* 1941-42, pt. 1, pp. 13-16, 18, 19-25, 40, 41-42, 87, figs. 8).—Field crops work (E. S. R., 84, p. 752) during the above period, reported on briefly, included variety tests with cotton (E. S. R., 87, p. 369), corn and hybrids, wheat, barley, oats, grain sorghums, sorgo, potatoes, sweetpotatoes, and miscellaneous grasses; breeding work with cotton, wheat, oats, sorghum, and sweetpotatoes; improvement of the quality of Oklahoma wheat

(E. S. R., 87, p. 511); cultural (including planting) experiments with barley, grasses, and sweetclover (E. S. R., 85, p. 615); irrigation tests with field crops, gardens, and pastures; spinning tests with cotton varieties; effects of fertilizers on yield and milling and baking quality of wheat; bin fumigation tests with wheat (E. S. R., 88, p. 190); fertilizer tests with alfalfa, sweetclover, and potatoes (E. S. R., 86, p. 620); storage experiments with sweetpotatoes; a revegetation study with pasture mixtures; pasture fertilization; and effects of rainfall on mineral composition of forage.

Crop rotation experiments in the Ohio Valley (1925-1936), T. C. McILVAINE and G. G. POHLMAN (*West Virginia Sta. Bul. 306 (1943), pp. 32, figs. 4*).—Crop yields and changes in soil organic matter contents are reported for 24 cropping systems on Wheeling fine sandy loam at Lakin, differing in kind of crop, in sequence, or in cover crops used. While no one specific rotation appeared superior to all others, several features of the various rotations have given consistently good results.

Liming proved profitable on all crops except potatoes and cowpeas, and even when these crops were in the rotation beneficial effects on other crops were enough to make liming profitable in most systems. Growing of cover crops in rotations providing no winter cover helped to maintain yields. The combination of rye and vetch, the best cover crop after corn and soybeans, gave the greatest total growth. Sweetclover sown in corn made very poor growth, probably because of excessive shading. Although crimson clover was not satisfactory in these tests, it succeeds in certain sections of West Virginia. Manure gave consistently good results, and since the State is well adapted to livestock production it should be conserved and returned to cropland. Yields were satisfactory in 2-yr. rotations involving manure and cover crops, but were not so high as in longer rotations. Potato yields were higher after clover and timothy sod than after corn or soybeans, and wheat following early potatoes or soybeans cut for hay outyielded wheat after corn. Spring oats have given very poor yields and might profitably be replaced by winter wheat or winter barley in the rotation.

Maintenance and increase of organic matter appeared to be related to high yields. Return of manure, use of sod crops, and cover crops for green manure have been valuable in maintaining a good supply of organic matter.

Regrassing for soil protection in the Southwest, E. L. FLORY and C. G. MARSHALL (*U. S. Dept. Agr., Farmers' Bul. 1913 (1942), pp. [2]+60, figs. 45*).—Designed to aid stockmen and farmers, particularly of the Southwest, in reestablishing depleted ranges where unfavorable climatic conditions and heavy demands have made improvement of the range by natural means slow and difficult, this publication discusses latest methods of artificial revegetation proved most effective in regrassing the ranges, describes the more promising grasses and their adaptation, and explains the latest methods for harvesting seed and establishing grass on various sites under a wide range of conditions.

Returning abandoned cultivated lands to grazing will save short-grass range, D. F. COSTELLO. (Coop. U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.], 5 (1943), No. 1, pp. 15-17, fig. 1*).—Practices recommended to hasten range improvement and increase productivity are to defer use until the first stage with its heavy stand of Russian-thistle is replaced by a perennial weed cover; stock land conservatively in all recovery stages following Russian-thistle; defer grazing of weed stages, if possible, until late summer or early fall; base estimates of desirable stocking rates on blue grama and buffalo grass when they appear in the advanced stages; use abandoned fields in conjunction with native grasslands

where feasible; and do not plow up abandoned lands making good recovery to native grass.

Forage improvement on sagebrush-grass range will produce more meat for victory, C. H. WASSER (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 4, pp. 3-5, fig. 1*).—Grading with a road grader, raiiling, or burning dense sagebrush ranges with an original scattered stand of grass has resulted in substantial increases in grass density and twice as much grass forage. The greatest increase in forage yield, three times that of untreated range, was obtained by clearing off sagebrush in the fall and reseeding to crested wheatgrass the next spring. To hasten grass revegetation it is advisable to protect or restrict grazing until after seed maturity the season before and one or more seasons after treatment.

Reseeding to increase the yield of Montana range lands, L. R. SHORT. (Partly coop. Mont. Expt. Sta.). (*U. S. Dept. Agr., Farmers' Bul. 1924 (1943), pp. [2]+26, figs. 13*).—Essential information for ranchers wanting to increase their forage supply deals with best conditions for sowing seed in regrassing nonproductive range lands; merits of crested wheatgrass (E. S. R., 72, p. 181; 85, p. 473), smooth bromegrass, yellow sweetclover, and other promising species for different sites; times and methods of sowing; management of reseeded range; and costs of and returns from reseeding.

Seeding permanent pastures, E. M. BROWN. (Coop. U. S. D. A.). (*Missouri Sta. Cir. 244 (1942), pp. [4]*).—Recommendations are made on seed mixtures for different purposes and soil conditions, soil preparation and treatment, time to plant, companion crop, and the reseeding of untillable pastures.

The effect of nitrogen fertilization of permanent pastures on seasonal distribution of yields and on nitrogen recovery in the herbage, R. R. ROBINSON and W. H. PIERRE. (W. Va. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 34 (1942), No. 8, pp. 747-764, figs. 4*).—Summer applications of N to the seven permanent pastures (E. S. R., 80, p. 333) did not give satisfactory increases in yield during summer unless soil moisture was adequate, yet plats receiving part of the N in summer made about the same total yield during the period 1930-36 as plats that received all of the N in spring. This favorable response to summer N, which may have a definite place in a program of intensive dairying, was obtained at both 100 and 200 lb. of sodium nitrate per acre per year. Values for percentage N recovery ranged from +92 to -51, depending on the season, botanical composition of the pasture, soil fertility level, and amount of N fertilizer added.

Comparison of the effect of clipping and grazing treatments on the botanical composition of permanent pasture mixtures, M. A. HEIN and P. R. HENSON. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 34 (1942), No. 6, pp. 566-573*).—The relative frequency of Kentucky bluegrass, and to a lesser extent of redtop and white clover, increased in the eight pasture mixtures (E. S. R., 80, p. 468) under grazing with sheep. Orchard grass remained unchanged, although in combination with perennial ryegrass it declined under grazing. Timothy gained under clipping, although only a small amount remained at the end of the 4-yr. period. The much greater frequency of perennial ryegrass under grazing than under clipping was attributed to failure of sheep to graze the species properly. Clipped plats in late summer contained more weeds, particularly crabgrass, than grazed plats. Clipping, in general, as evidenced by the lower total relative frequency of the grasses, was more severe than grazing, partly due to the added fertility from droppings under grazing.

Interrelationships of legumes and grasses grown in association, J. L. ROBERTS and F. R. OLSON. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron., 34 (1942), No. 8, pp. 695-701*).—Redtop, Kentucky bluegrass, Kansas common al-

alfalfa, lespedeza (*Lespedeza striata*), Wisconsin Dutch white clover, white sweet-clover, mammoth red clover, and alsike clover were grown in the greenhouse in all possible pure stands and combinations of one grass with one legume. No cases were observed where both legume and grass were either benefited or injured by associated growth as compared to growth in pure stands. In general, when one component of a mixture produced more dry weight or total N in mixture than in pure stand, the other produced less when in mixture. Differences in yield of a grass in associations studied could be explained by differences in amount of associated competing legume tissue, with the possible exception of relatively high yields of grass in association with red clover. In several mixtures, greater yields of dry weight and N were obtained from mixtures on a unit area of soil than from pure stands of a grass and a legume each on one-half unit area. Gains due to association were largest when a legume with vigorous growth habits was associated with a grass with weak growth habits.

The effect of dew on the curing of hay, H. B. HARTWIG. (Cornell Univ.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 482-485).—In 35 of 47 paired comparisons made during 1940 and 1941 hay was drier at 5 p. m. when cut at 8 a. m. while wet with dew than when mowed later after the dew had dried. New York farmers producing alfalfa, timothy, and mixed grass hay under conditions described evidently would not be justified in delaying the use of labor and machinery until dew has dried from the standing crop.

Efficiency of various phosphate fertilizers on calcareous soil for alfalfa and sweet clover, D. A. HINKLE. (N. Mex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 913-918, fig. 1).—Experiments reported comparing effects of phosphate fertilizers on yield and P content of alfalfa grown on Gila clay have been noted from another source (E. S. R., 87, p. 368). Annual yellow sweetclover in pot tests on this soil failed to produce as much dry weight or to absorb as much P from calcium metaphosphate as from Ammo-Phos (11-48-0) or treble superphosphate. N applied as ammonium sulfate slightly increased the absorption of P from superphosphate even though the roots were inoculated.

Boron fertilization of alfalfa and other legumes in Oregon, H. E. DREGNE and W. L. POWERS. (Oreg. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 902-912, figs. 5).—When alfalfa in field trials in different localities received B as borax and boric acid, yellowtop was controlled with 30 lb. of borax per acre. B may be applied to alfalfa as granular borax and sown like clover seed at rates of from 30 to 60 lb. per acre. Fall application appears preferable in arid sections and spring treatments in the humid sections of Oregon. B deficiency symptoms of alfalfa are described, and B contents of yellowed and normal plants are compared to the supply of available B in the soil. Most soils of the Willamette Valley and those west of the coast range in Oregon seem to be low in B. Certain sandy leached soils respond to B applications.

The effects of cutting systems on alfalfa, B. A. BROWN and R. I. MUNSELL ([Connecticut] Storrs Sta. Bul. 242 (1942), pp. 23, fig. 1).—Alfalfa grown on Charlton fine sandy loam in three experiments, 1934-40, was variously subjected to as many as 19 different systems of cutting for one or two seasons, and some plats also received additional fertilizer, especially P and K. Yields, composition of roots, and stands are discussed with special reference to relative merits of cutting alfalfa two and three times per season.

The three-cutting systems usually yielded more than corresponding two-cutting systems during the current season, but less the next season when all plats were cut twice and on the same dates. Largest yields of protein and probably

of digestible nutrients were obtained from three medium-stage (41-50 days old) cuttings per season, which resulted in very poor stands, especially when practiced for 2 successive years. While high yields of dry matter and good stands resulted from either two or three late-stage (more than 50 days old) cuttings per season, the hay, especially the June crop, was of inferior quality. Early-stage (less than 40 days old) cuttings were excellent in quality but yielded much less than either the medium- or late-stage systems, and three early cuttings per season were very injurious to stands.

After mowing, the percentages of sugars plus starch in the roots decreased for about 20 days but increased consistently after 30 days. Root storage was most rapid in the 41-50-day period after cutting. The largest and most consistent reductions in carbohydrates occurred between a September 20 third cutting and October 15. Even with third cuttings as late as October 15, roots decreased in reserves between then and November 15. Carbohydrates in roots, especially in fall, were closely related to percentages of alfalfa surviving winter.

Green and air-dry weights for determining hay yields of varieties of alfalfa, R. M. WEIHING. (Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 877-882).—The percentage of dry matter in a number of alfalfa varieties was determined in forage green and air-dried under cover. The percentage of dry matter in green alfalfa varied enough between some varieties at the time of cutting to make forage yields based on green weights inaccurate. Green weights evidently should be reduced by plats to oven dryness, to an exact percentage of dry matter, or to air dryness. Forage yields of varieties based on samples or plats air-dried under cover were nearly as accurate as those based on oven-dry weights. For comparisons between cuttings or years, air-dry forage yields should be reduced to a definite percentage of dry matter.

Plot technic studies with navy beans, E. E. DOWN and J. W. THAYER, Jr. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 919-922).—Analysis of data from bean plats involving a condition of severe competition between contiguous plats of different row widths, 1937-39, 1941, revealed that the three-row plat, discarding border rows, was the maximum width needed for an accurate comparison. Yields of one-row plats were too subject to competition for comparisons.

The mineral content of various clones of white clover when grown on different soils, R. R. ROBINSON. (U. S. D. A. coop. expt. stas.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 933-939).—When eight clones of white clover, increased vegetatively, were grown in the greenhouse on five widely different soils, marked differences were obtained in both yields of dry matter and in the Ca, P, and K contents of the different clones. Clones relatively high in Ca on one soil were also relatively high in Ca on other soils. Relative differences in P and in K contents tended to be maintained on different soils, but the agreement was not as close as with Ca. No relation was found between the mineral content of clones and their ability to grow at low levels of lime and P.

The chemical composition, growth, and certain deficiency symptoms of carpet grass, *Axonopus affinis*, as affected by lime and fertilizer mixtures, R. E. BLASER and W. E. STOKES. (Fla. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 8, pp. 765-768, figs. 2).—The growth and Ca, P, and K contents of carpet grass on Bladen fine sand (deficient in P, N, K, and Ca) were significantly better with a top dressing of lime and complete fertilizer than without fertilizer. Omission of Ca, P, or K from the fertilizer produced carpet grass which was lower in Ca, P, or K, respectively, and also resulted in lower grass yield. When P was omitted from the mixture, the grass was dull green to purplish green in color, believed characteristic of P deficiency. P deficiency

symptoms also occurred without fertilizer but were altered by the presence of Ca, K, and N. K deficiency symptoms (burning of blade tips) were present when K fertilizer was omitted from the treatment.

Evaluation of some morphological characters of corn in respect to their use in forecasting yield, K. R. KELLER. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 940-953).—Interrelationships between certain measurable morphological plant characters and the relationship of these characters before maturity to final yield in bushels per acre were studied. Leaf height and ligule height, plant height increase and dry weight increase up to flowering, and actual and estimated leaf area were shown to be highly correlated. Plant height, ear size, and number of ears (August measurements) were used to predict yields of both double- and single-cross hybrids. "The general approach of using regression equations computed from various plant measurements appears to offer some promise as a method of forecasting yields of corn."

The chemical composition of the cotton plant and the uptake of nutrients at different stages of growth, I. C. OLSON and R. P. BLEDSOE. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 222 (1942), pp. 16, figs. 4).—The time and rate of absorption of plant foods by cotton were studied, 1939-40, under field conditions on fertilized Cecil and Tifton sandy loams and Clarksville gravelly loam, representative of the Piedmont, Coastal Plain, and Limestone Valleys, respectively. These soils are acid and low in base-exchange capacities, organic matter, and mineral nutrients. See also a note on similar work with the pimienta (E. S. R., 85, p. 51).

Dry weight on Cecil soil (producing 2,000 lb. of seed cotton) averaged 9,720 lb. per acre, Tifton (495 lb. of seed cotton) 6,176 lb., and Clarksville (807 lb. of seed cotton) 5,041 lb. The quantity of nutrients (N, P_2O_5 , K_2O , CaO, and MgO) absorbed from the three soils totaled 538, 393, and 311 lb., respectively. On the Cecil and Tifton soils the heaviest uptake of nutrients occurred from early-boll formation to maturity, while on Clarksville soil more was taken up during the early-square to early-boll stage. On Cecil soil absorption of nutrients was greatest 105 days after planting, when boll formation was rapid. At 120 days or longer after planting dry weight production and nutrient absorption was largely confined to the bolls. Some translocation of nutrients from plants to bolls occurred at the late growth stages. The amount of nutrients found in the cotton plant exceeded that ordinarily added in fertilizer mixtures, indicating the importance of plant residues in maintaining the fertility of cotton soils. The average amounts of nutrients found in the mature plants for all three soils approximated N 104 lb., P_2O_5 38, K_2O 97, CaO 132, and MgO 43 lb.

Row widths and cotton production, D. M. SIMPSON and E. N. DUNCAN. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 6, pp. 544-552).—Review of row width experiments with cotton at several stations indicated that narrow rows yield more per acre while wider rows yield more per row. Since planting and cultivating operations are done by the row, row footage per acre is important in determining production costs. Row widths may be varied from 2.5 to 4.5 ft. without materially changing cost of cultivation per row, and, in general, should be adjusted so as to result in the lowest cost per pound of cotton produced or the greatest production return for labor and equipment. In experiments at Knoxville, Tenn., 1938-40, yields of cotton per row increased consistently and profitably as row widths were widened from 2.5 to 4.5 ft. Optimum row widths may depend upon local conditions regarding land value, labor, and equipment costs.

Observations of kudzu, *Pueraria thunbergiana* Benth., seedlings, P. TABOR. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 5, pp. 500-501).—Responses to different cultural and environmental factors in nurseries.

Lespedeza in the Coastal Plain area, J. I. STEPHENS. (Ga. Coastal Plain Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 7, p. 685).—Annual lespedezas thrived in low and moist sandy soils but made poor growth on uplands under cultivation, probably due to nematodes. "Annual lespedeza appears unable to tolerate nematodes when associated with drought."

Studies of some factors affecting fruit setting in *Solanum tuberosum* in the field in Louisiana, M. T. HENDERSON and E. L. LECLEER. (U. S. D. A. coop. La. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 66 (1943), No. 2, pp. 67-76).—Bagging of potato flower clusters was detrimental to fruit setting in 1940 and 1941, but kraft-paper bags were more satisfactory than cheesecloth bags. Application of pollen at time of emasculation was relatively ineffective in inducing fruit set in the Katahdin variety. One pollination 24 hr. after emasculation was as good as pollination at emasculation followed by a second pollination 24 hr. later. High temperature and low moisture or low moisture proved unfavorable to fruit setting. In conducting a potato-improvement program by breeding, the breeder evidently should arrange for pollination during a period in which relatively low temperature and adequate soil moisture conditions normally prevail.

High proportion of labor in growing sugar beets can be saved in 1943 by mechanizing, E. M. MERVINE. (Coop. U. S. D. A.). (*Colo. Farm Bul. [Colorado Sta.]*, 5 (1943), No. 1, pp. 3-4, fig. 1).—Use of cracked seed in single seed-ball planters, mechanical thinning by cross-blocking, and mechanical harvesting are described as labor saving.

Influence of some soil and cultural practices on the sucrose content of sugar beets, G. C. KENT, C. M. NAGEL, and I. E. MELHUS. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 17 (1943), No. 2, pp. 163-173, fig. 1).—Average acre production of sucrose in different commercial fields of sugar beets in northern Iowa, 1937-40, varied from 2,023 to 4,417 lb., sucrose percentage from an average of 11.85 to 16.48, and beet yields from 7.57 to 13.40 tons per acre. While the highest sucrose yield resulted from the greatest tonnage and highest sucrose percentage, no relation was found between tonnage and sucrose percentage of beets. In 1937 sucrose production averaged 3,487 lb. per acre on fields planted before May 14 and after May 18, 3,023 lb.; planted on April 29, 1938, 3,630 lb. and planted on May 29 averaged 2,709 lb. Tonnage yield of beets was greater on muck than on mineral soils, yet beets grown on mineral soil contained a higher percentage of sucrose. The maximum percentage of sucrose was not found in beets harvested before October 1, 1938-40, but little appeared to be gained in sucrose percentage by leaving beets in the ground after October 7-10. When 1 in. or more of rain fell during the last half of the harvest season, or after October 15, the sucrose percentage did not decrease over 0.2 percentage points in the first 3 days after the rain, but after from 7 to 10 days the decrease amounted to from 0.5 to 4.2 points. Subsequently, the sucrose percentage rose. If beets cannot be lifted within 3 days after 1 in. of rain falling during the last half of the harvest period, they should, if possible, be left in the ground at least 10 days after the rain.

Responses of biennial sweet clover to moisture, temperature, and length of day, T. J. SMITH. (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 10, pp. 865-876, fig. 1).—White (*Melilotus alba*) and yellow (*M. officinalis*) biennial sweet-clovers were grown under varying conditions of temperature, moisture, and exposure to daylight (11-hr. normal and 17-hr. day) both in field and in pots in the greenhouse at Columbus, Ohio. Longer days, within limits studied, decreased the proportion of total plant weight in the roots, increased top growth, restricted crown bud formation, and reduced the percentages of N and total carbohydrates in the roots. Under the 17-hr. day biennial plants bloomed within 3 mo. after planting. Cool temperatures increased the proportion of total plant weight in

the roots. Low moisture supply increased root weights. The two species were very similar in contents of N, total sugars, starch, polysaccharides, and total carbohydrates.

The relations to yield of certain plant characters of winter wheat as influenced by different tillage and sequence treatments, L. F. LOCKE, O. E. RAUCHSCHWALBE, and O. R. MATHEWS. (U. S. D. A.). (Jour. Amer. Soc. Agron., 34 (1942), No. 7, pp. 628-645, figs. 3).—Plant characters of wheat causing differences in yield between certain crop sequences and tillage methods were studied in plats at Woodward, Okla., 1929-34, when seeded to Turkey wheat on the same date, usually at the same rate, and with the same type of drill. More than 95 percent of the variations in yield between treatments and between years were explained by number of kernels per unit area, which was determined more by number of heads per unit area than by kernels per head. Number of heads per unit area and plant height were also good indicators of yield. Excepting number of kernels per unit area, characters studied differed in their relative effect on yield in different years. On the average, head characters were unimportant in fixing yield. Continued adjustments made throughout the life of the plant tend to maintain it in a condition to take advantage of existing moisture and fertility conditions, and the times when adjustments occur modify the relative importance of different plant characters.

Fairfield wheat, G. H. CUTLER (Indiana Sta. Cir. 276 (1942), pp. 8, figs. 4).—Fairfield, developed from a cross between Purkof and Fulhio wheats, is characterized by adaptation to a wide range of soil and climatic conditions, high grain yields, superior winter hardiness, suitability for combine-harvesting, and high resistance to loose smut and mosaic. Comparative data on milling and baking qualities of Fairfield and other standard winter wheats indicate that it possesses desirable soft wheat characteristics.

Seed inspection and testing during 1942, M. T. MUNN (Farm Res. [New York State Sta.], 9 (1943), No. 1, pp. 13, 15).—Violations of the seed law in regard to crop variety, purity, weed seeds, noxious weeds, and germination are tabulated and discussed for numerous official samples of farm crop seeds collected in 1942.

Legume inoculant tests for 1942, A. W. HOFER (Farm Res. [New York State Sta.], 9 (1943), No. 1, p. 7).—Results of tests of 73 commercial cultures for inoculation of alfalfa, clover, peas, beans, lima beans, soybeans, and birdsfoot trefoil are tabulated.

The dissemination of prickly pear seed by jack rabbits, F. L. TIMMONS. (U. S. D. A. coop. Kans. Expt. Sta.). (Jour. Amer. Soc. Agron., 34 (1942), No. 6, pp. 513-520, figs. 2).—Droppings of jack rabbits that had fed upon ripened pricklypear (*Opuntia macrorrhiza*) fruits, collected in a cactus-infested pasture at Hays, Kans., averaged about 2.5 seeds per pellet, while those found in nearby uninfested fields only occasionally contained seeds. Such seeds germinated about 50 percent higher than seeds from dried fruits. Jack rabbits evidently are important agents in dissemination of viable pricklypear seed through western Kansas pastures.

HORTICULTURE

[Horticultural studies by the Arkansas Station] (Arkansas Sta. Bul. 428 (1942), pp. 13-15, 17, 49-51).—Among studies, the progress of which is discussed, are the thinning of peach fruits and the pruning of apple and peach trees, both by J. R. Cooper; the effects of mulching on the strawberry, by J. E. Vaile; and the placement of fertilizers for vegetables, the value of lime in vegetable culture, staking and pruning tomatoes, irrigation of vegetables, nitrogen require-

ments of the strawberry, the culture of the strawberry, and the value of stable manure for vegetables and strawberries.

[Horticultural studies by the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1941-42, pt. 1, pp. 39-40, 42-45, 87-88, figs. 2*).—Among studies discussed are the testing of new varieties of fruits and vegetables, irrigation of vegetables, fertilizers for vegetables, use of preharvest sprays to reduce dropping of fruits, effect of high temperature on the strawberry plant, methods of handling freeze-injured grapevines, poultry manures for grapes, methods of propagating trees and shrubs, and the culture of greenhouse plants.

Victory gardens, V. R. BOSWELL (*U. S. Dept. Agr., Misc. Pub. 483, rev. (1943), pp. 16, fig. 1*).—As in the earlier edition (*E. S. R., 87, p. 58*), this presents simple, practical information to aid the home gardener.

The farm garden, J. H. and W. R. BEATTIE (*U. S. Dept. Agr., Farmers' Bul. 1673, rev. (1942), pp. [2]+67, figs. 26*).—This revised publication (*E. S. R., 66, p. 432*) includes general information on planning, planting, fertilization, and cultural requirements of specific vegetable crops.

An experimental mechanism for the band-placing of fertilizer in irrigated beds, A. E. GRIFFITHS. (*Ariz. Expt. Sta.*) (*Amer. Soc. Hort. Sci. Proc., 40 (1942), pp. 539-544, figs. 3*).—A descriptive account is given of the structure and operation of a single-bed experimental sled which provides for the application of fertilizer and the drilling of seed in a single operation. The device was particularly effective with simple, powdered, inorganic types of fertilizer, but gave good results with such materials as blood meal or finely divided goat manure.

Nutrient solution culture of greenhouse crops, R. B. WITHROW, J. P. BIEBEL, and T. M. EASTWOOD (*Indiana Sta. Cir. 277 (1943), pp. 27, figs. 2*).—This is a revision of Circular 232 (*E. S. R., 78, p. 782*).

The influence of methods of heating and covering electric hotbeds on field production of vegetables, A. M. PORTER and M. L. ODLAND. (*Univ. Conn.*). (*Amer. Soc. Hort. Sci. Proc., 41 (1942), pp. 251-254*).—Cellulose acetate film proved better than glass as a cover for lettuce plants, and the heat of Mazda lamps was better than that from heating cables for cauliflower. From the standpoint of quality, cool-season crops grew better with the heat of Mazda bulbs and film for plant protection. With warm-season crops, such as tomatoes and peppers, the yields were larger from cable-heated beds but the increases were not sufficient to justify the higher cost over bulb heat.

Vegetable storage will help win the war, A. M. BINKLEY (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 4, pp. 12-13, fig. 1*).—Suggestions are made as to the possibilities in the storing of vegetables, with particular attention to temperature, moisture, and ventilation requirements. In addition, the relation of the condition of the crop and the variety of vegetables are considered.

A comparison of varieties of Refugee beans, W. T. TAPLEY (*Farm Res. [New York State Sta.], 9 (1943), No. 1, pp. 14, 16*).—Yield and other related information is presented for five varieties—Idaho, U. S. No. 5, Sensation 1066, Sensation 1071, and Medal.

A study of methods for planting beets, M. L. ODLAND and A. M. PORTER. (*Univ. Conn.*). (*Amer. Soc. Hort. Sci. Proc., 41 (1942), pp. 255-258, fig. 1*).—The differences in yield obtained in two methods of planting beet seed, (1) an excess of seed with subsequent thinning and (2) sufficient seed to establish a stand without later thinning, were not sufficient from the growers' standpoint to result in definite recommendations. The method of planting would depend on the cost of seed, purposes for which the crop was grown, etc. Even in testing beet varieties, either method should prove satisfactory.

Great Lakes, a new head lettuce variety adapted to summer conditions, K. C. BARRONS and T. W. WHITAKER. (Coop. U. S. D. A.). (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 252-254, fig. 1).—A description is presented of a new lettuce variety selected from among breeding strains developed by the U. S. Department of Agriculture in California and tested by the Michigan Station because of its ability to form solid heads under warm weather conditions and freedom from early seed stalk formation. In addition, the new variety was observed to be free from tip burn at times when Imperial 44 and Imperial 847 were badly injured.

Nutrient absorption by a summer crop of lettuce in Salinas Valley, California, O. A. LORENZ and P. A. MINGES. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 523-527).—The nitrate nitrogen in the midrib of the wrapper leaves of lettuce plants grown on plats not receiving nitrogen varied from approximately 240 p. p. m. 2 weeks after thinning to a low of 140 p. p. m. at the time of market maturity. Plants on soil receiving 480 lb. of ammonium sulfate per acre contained 500 p. p. m. of nitrate nitrogen at market maturity. Applications of K or P fertilizers to the soil did not increase the amounts of these elements found in the plants. Applications of nitrogen did not have any effect on the K or P contents of the plants, an indication of the natural high content of P and K in the soil used. The entire lettuce crop at market maturity had absorbed 47 lb. of nitrogen, 7 lb. of phosphorus, 117 lb. of potassium, and 30 lb. of lime.

New pea varieties compared for yield and plant characters, W. D. ENZIE (*Farm Res. [New York State Sta.]*, 9 (1943), No. 1, pp. 8-10, fig. 1).—Information is given on the ripening season, plant height, pod length, yield, etc., of a number of pea varieties, including recent introductions such as Greenland, Ranger, Atlas, Shasta, and Miracle.

A comparison of the chemical composition of artificially produced parthenocarpic fruits and normal seeded fruits of peppers, B. E. JANES. (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 432-436, figs. 3).—Analyses of the fruits of the California Wonder pepper in which parthenocarp was induced by treatment with 1 percent indolebutyric acid in lanolin, and of control fruits of the same age obtained by pollination, showed very few differences in composition. The dry weight expressed as percentage of the fresh weight was nearly equal in both types of fruit until ripening began, when the rate of dry weight formation became more rapid in the parthenocarpic fruits. When carbohydrates were calculated on a dry weight basis there were no differences between the two types of fruit, but on a fresh weight basis there was from 1 to 1.5 percent more sugar in the parthenocarpic fruits than in the seeded fruits. Total nitrogen was the only constituent other than moisture in which a consistent difference was found between the parthenocarpic and the seeded fruits.

Plant- and fruit-pruning as a means of increasing fruit set in muskmelon breeding, E. A. WOLF and J. D. HARTMAN. (Ind. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), pp. 415-420, fig. 1).—Of six fruit and plant pruning experiments, the one in which plants were pruned to a main and two axillary branches, from which terminal buds and all growing points (except the blossom to be pollinated) were removed, proved most effective, with 79.5 percent of the pollinations resulting in success. Fruit pruning had a noticeable effect on the number of available hermaphroditic flowers produced by the plants. On completely unpruned plants, such flowers became rare as the plant increased in size. Pruning had no material effect on the length of time required to mature a given fruit.

An inexpensive method of growing tomato plants on the farm, K. C. BARRONS and S. B. APPLE (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 229-235,

fig. 1).—A simple cloth-covered frame is described, with information as to its operation and costs. A comparison in 1942 of home-grown frame plants and southern-produced plants was clearly in favor of the frame tomatoes, both in percentage of living plants and returns per acre.

The Early Chatham tomato, P. H. BOWSER (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 245-248, figs. 2).—This new tomato, which ripened its fruits at least 1 week earlier than Earliana, was introduced by the Upper Peninsula Substation. It was found of real merit in northern gardens where the frost-free period is short. The plant is determinate in growth, and the fruits are small but desirable in shape, color, and quality.

Plant-tissue tests as a guide to fertilizer treatment of tomatoes, E. M. EMMERT (*Kentucky Sta. Bul.* 430 (1942), pp. 48).—Rapid tissue tests were made upon the foliage of tomatoes grown in soil and sand cultures providing a wide range of available N and P. Correlating the results of observations with growth and fruiting behavior, it was evident that different levels of N and P were needed at different stages in the development of the tomato plant. For example, in the early vegetative period before much blooming occurred the concentration of N should be well above 1,000 p. p. m. in the leaves, but as blooming increased and the fruit began to set, the N concentration should drop below 1,000 but be held well above 500 p. p. m. In the early stage P should be up to 200 p. p. m., and in the fruiting stage at least as high as 400 p. p. m. Differences in soil volume, in length of day, and in moisture influenced the results considerably. One treatment that showed particular promise in diminishing the effect of excess N and increasing fruit set was the placement of a heavy band of phosphate at a 2-in. depth as close to the plants as practical, just before fruit setting. Large applications of slowly available nitrogenous materials should be avoided with tomatoes growing on naturally fertile soils since the N from such materials might become available in excessive amounts at the time of fruit setting. The techniques of plant-tissue tests are discussed.

Natural crossing in tomatoes as related to distance and direction, T. M. CURRENCE and J. M. JENKINS, Jr. (Minn. and S. C. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 273-276, fig. 1).—In identical arrangements, plantings of Pritchard tomatoes surrounded with a potato leaf variety were grown at St. Paul, Minn., and Charleston, S. C. At St. Paul the largest amount of crossing recorded on any one plant was 5.2 percent, with numerous plants yielding no evidence of crossing. No crossing was recorded beyond 42 ft. in the direction of the prevailing wind. At Charleston the total amount of crossing was slightly less, with a maximum of 5.0 percent recorded. The pollinating insects apparently followed the path of least resistance, as higher crossing was observed in the direction of the prevailing wind.

Nematode resistance test of tomatoes, F. A. ROMSHE. (Okla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 40 (1942), p. 423).—Of 221 lots of tomatoes (including introductions from South America) planted on an area heavily infested with nematodes, 9 lots of *Lycopersicon peruvianum* were completely free of root knots and 10 plants of the husk tomato were practically free. Since adjacent plants of other types, including garden varieties, were heavily infested, it was evident that the above kinds possessed actual root knot resistance.

Fruit industry problems of 1943, V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 208-210).—Suggestions are given as to pruning, soil management, spraying, and the handling of fruit under the difficult conditions of shortage of labor, materials, etc.

Careful planning of orchard work can help alleviate effects of labor shortage later, F. M. GREEN (*Colo. Farm Bul.* [Colorado Sta.], 5 (1943), No. 1,

pp. 7-10, fig. 1).—Suggestions are made as to the more efficient handling of orchard operations such as pruning, cultivation, spraying, fruit thinning, and harvesting.

Improved rootstocks and some problems they present, H. B. TUKEY (*Farm Res.* [New York State Sta.], 9 (1943), No. 1, pp. 18-19, figs. 2).—Several of the Malling rootstocks are discussed with respect to their effect on the size of the tree, with comments on the need of careful handling in the nursery to prevent mixtures since the resulting budded trees vary greatly in size and usefulness.

A legume program for orchards on sandy soils, N. L. PARTRIDGE (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 249-252).—In view of the probability that certain fertilizing materials, particularly nitrogenous substances, will be limited in supply during the war, various legumes such as sweetclover, soybeans, vetch, and alsike clover, sown singly or in combination with nonlegumes, are discussed as to their value in maintaining orchard fertility.

A study of some phases of apple production in southern New Jersey (*New Jersey Stat. Bul.* 703 (1942), pp. 16, fig. 1).—Based on a detailed survey over a 2-yr. period on seven representative orchards in Burlington and Gloucester Counties and on general knowledge, suggestions are presented with a view to the improvement of apple culture in southern New Jersey. Among subjects discussed are the financing of orchard enterprises, the keeping of accurate records, the selection of proper soils, soil rotations and management, the use of lime to maintain effective soil reactions, varieties, fruit thinning, fertilizers, spraying, etc.

Filler apple trees and their management, C. E. BAKER (*Indiana Sta. Bul.* 474 (1942), pp. 14, fig. 1).—In 1934, at the beginning of the twelfth growing season, part of a Grimes Golden and Delicious orchard originally set 20 by 20 ft. was thinned so that the trees stood 28.5 ft. apart. As compared with nonthinned trees, the thinned yielded less gross income per acre during the period 1935-39. However, the thinned trees were individually more productive, showing that the crowding was exerting a depressing effect on yield per tree. As measured by trunk girth increase and general vigor, the spaced trees had benefited by the release. It was difficult to obtain good fruit color on the crowded Delicious trees, and even with Grimes Golden the finish on the fruits was not satisfactory in the crowded area. It was more difficult to control insect and fungus pests in the unthinned section, and during a prolonged drought the unthinned trees suffered considerable loss of leaves and fruits while the thinned came through without damage. At the end of the seventeenth season, the unthinned plots were also thinned. The accumulated damage from crowding was such as to cause continued lower production following this release.

Effect of spray materials on finish and keeping quality of apples, E. J. RASMUSSEN (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 263-271, figs. 3).—Bordeaux mixture and certain proprietary copper materials when applied to apple trees in Michigan in an all-season schedule resulted in fruit of poor finish as compared with that of trees sprayed with lime-sulfur or wettable sulfur. Of varieties studied, McIntosh and Jonathan were the most susceptible, and Delicious and Northern Spy the most resistant to copper injury. Rhode Island Greening, Grimes Golden, Wagener, and Wealthy were intermediate. None of the copper fungicides used proved safe on McIntosh at any stage. With Jonathan they were used safely in the later cover sprays in some years. The use of copper materials in all-season schedules is not recommended for Northern Spy or Delicious, but they may be possibly substituted for sulfur in some of the late applications. Russeted fruits are not only inferior in appearance but they lose weight and shrivel rapidly in storage.

Peach culture in Missouri, T. J. TALBERT (*Missouri Sta. Bul.* 455 (1942), pp. 36, figs. 19).—Information is presented with respect to climatic factors involved in the success of peach growing, the selection of sites and soils, varieties, pollination, contour planting, soil management, fertilization, pruning, fruit thinning, insect and fungus enemies, spraying, harvesting and marketing, etc.

Recommended peach varieties for New York State, L. M. VAN ALSTYNE and H. O. BENNETT (*Farm Res. [New York State Sta.]*, 9 (1943), No. 1, pp. 16, 17).—A number of varieties covering the fruiting season are briefly discussed.

Soil management for roses in the greenhouse, L. C. WHEETING (*Washington Sta. Bul.* 421 (1942), pp. 20, figs. 4).—The development of yellow or mottled foliage on Talisman roses has caused severe losses to Washington greenhouse growers. The continued use of hard water resulted in soil pH values of 8.5 and above and promoted a condition in which plants could not obtain sufficient iron. The use of fertilizer materials which leave acid residues in the soil counteracted the harmful effects of the hard water. Sulfur applications were also beneficial. The best yield of roses was obtained at pH values between 6.0 and 7.0. The best production was obtained by maintaining a relatively high concentration of K, a medium to low concentration of P, and a medium supply of available N. An NPK ratio of 2:2:4 is suggested.

The cause and control of defoliation in cut holly, J. A. MILBRATH and H. HARTMAN (*Oregon Sta. Bul.* 413 (1942) pp. 11, figs. 2).—Holly packed wet and stored where ethylene was present did not lose its leaves in 30 days when the temperature was held at 31° F. At 36°, 25 percent of the leaves were lost, and holly was completely defoliated after 2 weeks in a room at 42°. Packed wet and stored where there was no ethylene present holly did not lose its leaves in 30 days at either 31° or 36°, but started to lose leaves in 2 weeks at 46°. When stored wet in an open building, where the temperature ranged from 20° to 60° but remained in the lower half most of the time, holly was bright and fresh after 40 days. Partial dehydration after cutting prevented loss of leaves, apparently by limiting the development of the abscission layers. The dipping of holly branches in solutions of α -naphthaleneacetic acid was helpful in preventing abscission. A 0.01-percent solution prevented abscission entirely for a 14-day period at 70° to 80°. Comparable check lots dipped in water lost all their leaves in 3 days. Even a 0.001-percent solution had a marked retarding effect on defoliation. No injury was observed from the hormone treatments except at excessive concentrations. No objectionable residues or deposits were left on the leaves. When treated holly was packed with apples, which give off ethylene in their ripening process, there was some defoliation, leading to the suggestion that holly should not be shipped or stored with fruit or exposed to other sources of ethylene.

The importance of tung seed selection, R. D. DICKEY. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 127-130).—A comparison of the yield of seedling trees grown from parents of high-yielding capacity with that of seedlings from unselected parental sources showed the importance of selection. A study of individuals in two selected progenies showed that fairly high percentages came relatively true to type, thus confirming further the desirability of using seed of known parentage.

Native plants as possible sources of rubber, L. KNUDSON (*Farm Res. [New York State Sta.]*, 9 (1943), No. 1, pp. 2, 5, fig. 1).—A new method was devised for the rapid determination of rubber in plant tissues, and nearly 3,000 tests were made on leaves, roots, stems, and flowers of various species, including goldenrod, milkweed, Indian hemp (*Apocynum cannabinum*), and Russian dandelion.

Can rubber be produced in Colorado? (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 4, pp. 2, 15, fig. 1*).—Information is presented on progress in growing such rubber-producing plants as guayule and Russian dandelion.

Agriculture in the Americas (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Agr. in Amer. 3 (1943), No. 1, pp. 18+[2], figs. 19*).—Among articles included are *The Technique of Plant Exchange*, by B. Y. Morrison (pp. 3-6); *More Rubber From Castilla?* by O. F. Cook (pp. 7-9); and *The Future of the Forests*, by C. L. Forsling (pp. 13-16).

FORESTRY

Forestry in wartime: Report of the Chief of the Forest Service, 1942 (*U. S. Dept. Agr., Forest Serv. Rpt., 1942, pp. 23*).—This administrative report contains information relating to forest resources and the war; the need of regulating cutting practices; the work of the Forest Service in the development of new and improved uses for wood, particularly in relation to the war; new sources of rubber; fire control and general management of the national forests, etc.

[Forestry investigations by the Arkansas Station] (*Arkansas Sta. Bul. 428 (1942), pp. 51-52*).—Information is presented on timber marketing studies and on the need of sustained yield practices for maintaining hardwood forests and hardwood lumber supplies.

The Rainbow Forest plantations; Report of progress, 1942, H. W. HRCOCK (*Connecticut [New Haven] Sta. Bul. 464 (1942), pp. 615-702, pls. 5*).—A history and description of the forest area are presented, with an account of various destructive influences, such as insects, plant diseases, and hurricane damage in 1938, and descriptive accounts of the various experimental plots from the time of their establishment to date. Suggestions are given for the planting and management of white pine stands and on the handling of other species.

Natural reproduction of pines in east-central Alabama, K. A. BRINKMAN and P. A. SWARTHOUD. (Coop. U. S. D. A.). (*Alabama Sta. Cir. 86 (1942), pp. 12, figs. 3*).—A survey of woodlands in four Alabama counties revealed a lack of satisfactory young pine stands on 80 percent of the 445 plots examined, largely because of unsatisfactory older stands. An inadequate seed supply was apparently responsible for the partial or complete failure of pine reproduction on about one-half of the areas. Fires prevented the establishment of adequate stands of young pine on about 40 percent of the areas. Competition from shrubs and young hardwood trees and from the crowns of large trees had an adverse effect on about one-fourth of the areas. Grazing by cattle was harmful to survival and growth of pine seedlings, and hogs were especially destructive to young longleaf pines. Severe erosion resulted in poor reproduction, while light to moderate erosion apparently favored pine reproduction by exposing the underlying mineral soil.

Preventing destructive fires in southern woodlands (*U. S. Dept. Agr., Farmers' Bul. 1926 (1943), pp. [2]+15, figs. 14*).—General information is presented on the significance of woodland protection during wartime, causes of fires in woodlands including accidental and intentional burning, relation of burning to grazing values and pest control, and suggestions for the prevention and control of fires.

DISEASES OF PLANTS

[Plant disease work by the Arkansas Station]. Partly coop. U. S. D. A.). (*Arkansas Sta. Bul. 428 (1942), pp. 30-35*).—Brief summaries of results are given by H. R. Rosen and C. K. McClelland on breeding of oats resistant to crown rust in relation to winter pasture usage, by V. H. Young on increasing

cotton yields by disease control, by E. M. Cralley on resistance of rice varieties to blast (*Pyricularia oryzae*), and by S. B. Locke on fungicidal control of defoliation diseases of tomato.

Plant pathology (*Oklahoma Sta. Bien. Rpt. 1941-42, pt. 1, p. 62-65, figs. 2*).—Brief summaries are presented of results with wheat and barley loose smut control, forecasting wheat leaf rust damage, cotton seed treatment, nematode control in sweetpotato bedding roots, and prevention of losses by plant disease surveys.

Names for the bacterial plant pathogens, A. J. RIKER and I. L. BALDWIN. (Univ. Wis.). (*Chron. Bot.*, 7 (1942), No. 6, pp. 250-252).—A critical review of the present chaotic situation in bacterial taxonomy, with recommendations.

Interference between bacterial viruses.—I, **Interference between two bacterial viruses acting upon the same host, and the mechanism of virus growth**, M. DELBRÜCK and S. E. LURIA (*Arch. Biochem.*, 1 (1942), No. 1, pp. 111-141, figs. 6).—Multiple infection of *Escherichia coli* with particles of two different bacteriophages resulted in complete suppression of one and normal growth of the other. This interference was studied in detail under various experimental conditions, and the bearing of the results on other cases of interference between viruses (both plant and animal) is discussed. There are 19 references.

Interference between inactivated bacterial virus and active virus of the same strain and of a different strain, S. E. LURIA and M. DELBRÜCK (*Arch. Biochem.*, 1 (1942), No. 2, pp. 207-218).—Carrying studies of the two *Escherichia coli* bacteriophages further (see preceding abstract), it is shown that one phage, after ultraviolet inactivation, retained its ability to interfere with the growth of another phage, and a single partially inactivated particle proved sufficient to suppress growth of the second phage in one bacterium. This partially inactivated phage was adsorbed by the sensitive bacteria and inhibited their growth without lysis. It was able to interfere with growth of active virus of the same kind. This interfering activity, though more resistant to irradiation than the reproducing activity, was progressively destroyed by larger doses of ultraviolet rays. The results are believed to support the hypothesis that interference between bacteriophages is due to competition for a "key-enzyme" present in limited amount in each bacterial cell. The bearing of these findings on the problem of antiviral vaccines produced by irradiation is discussed.

Respiration and virus diseases, M. W. WOODS. (Md. Expt. Sta.). (*Chron. Bot.*, 7 (1942), No. 6, pp. 243-244).—A review of papers on respiration in virus-infected plants.

Optimal conditions for the hydrolysis of arabogalactan by *Aspergillus niger*, E. J. RATAJAK and H. S. OWENS (*Bot. Gaz.*, 104 (1942), No. 2, pp. 329-337).

Variations in sporulation of different isolates of *Colletotrichum destructivum*, S. J. P. CHILTON. (U. S. D. A. et al.). (*Mycologia*, 35 (1943), No. 1, pp. 13-20, figs. 2).—Among the 14 single spore isolates of the fungus studied, variant types were obtained from sectors and patches in old cultures which differed from the originals in various culture characters. Some produced very few spores, others more than the parent cultures, though the latter retained their ability to sporulate through 10 successive single spore generations. Transfers to sterile or living host tissues failed to enable poorly sporulating cultures to regain their ability to sporulate heavily. Two variants were obtained from lesions on red clover seedlings produced under sterile conditions. Conidia were predominantly uninucleate. It is concluded that the loss of sporulation in cultures was due to the occurrence of poorly sporulating types differing genetically from the original type which they replaced.

Biochemistry of *Fusaria*: The influence of diphosphopyridine nucleotide on alcoholic fermentation (in vivo), B. S. GOULD, A. A. TYTELL, and H. JAFFE (*Jour. Biol. Chem.*, 146 (1942), No. 1, pp. 219-224, figs. 2).—The in vivo role of diphosphopyridine nucleotide (coenzyme I) was studied and shown to be a limiting factor in alcohol production by *Fusarium trichothecoides*, suggesting that fermentation by living cells is similar to that in cell-free preparations involving oxidation-reduction reactions and phosphorus transfer.

Growth substances and dormancy of spores of *Phycomyces*, W. J. ROBINS and V. W. and F. KAVANAGH (*Bot. Gaz.*, 104 (1942), No. 2, pp. 224-242, figs. 4).—Dormant spores of *P. blakesleeanus* are considered to lack sufficient available Z factors for germination. Extracts of certain natural products or the Z factors furnished in the basal medium supplied the deficiency, which may also be met by treatment with heat, cold, acetate, or pyridine—thought to change the Z factors in the spores from an unavailable to an available form.

Moisture-relation as a determinant factor in the transformation of the basidia of certain Polyporaceae, S. R. BOSE (*Mycologia*, 35 (1943), No. 1, pp. 33-46, figs. 8).—Experimental evidence is given that it is mainly the water relations which control transformation of basidia into hyphal elongations with clamp connections and terminal spores and vice versa, species of *Polyporus*, *Polystictus*, *Trametes*, *Fomes*, and *Favolus* having been used. There are 19 references.

Cultural differences among single basidiospore isolates of *Rhizoctonia solani*, B. EXNER and S. J. P. CHILTON. (La. Expt. Sta.) (*Phytopathology*, 33 (1943), No. 2, pp. 171-174, fig. 1).—A total of 395 single-basidiospore isolates were obtained from 10 basidial mats occurring spontaneously on lima bean, potato, and alligator weed (*Alternanthera phylloxeroides*). Since isolates from the same mat differed in growth rate and other culture characters, it is concluded that some type of segregation occurs in basidiospore formation.

The use of fungicides during wartime, I-III. (N. Y. State Expt. Sta.) (*Canner*, 96 (1943), Nos. 6, pp. 16-17, 58, figs. 3; 7, pp. 14-15, 42, 44, figs. 4; 8, pp. 14-17, figs. 3).—Three papers in this series are presented.

I. *The nature of diseases on vegetable crops*, G. L. McNew.—A general introductory account.

II. *Effect of soil fertility on returns from use of fungicides*, G. L. McNew and C. B. Sayre.—The results of seed treatments of peas with Spergon and of spraying tomatoes against defoliation diseases with an insoluble copper compound (1941-42) are summarized as showing the greater effectiveness of fungicidal control on properly fertilized plats and the great loss in the value of the fertilizer from omission of the disease control treatments.

III. *Value of different seed treatments for lima beans*, G. L. McNew.—This is a progress report on tests of promising fungicides on the varieties Henderson Bush, Clark Green, and Fordhook, with the suggestion that "general treatment of lima bean seed with Spergon at about 2 oz. per bushel will be profitable." Thiosan, applied at 1 or 1.5 oz., and Fermate at 2.5 oz. should be given limited tests, with an ounce of graphite added, particularly with Fermate if the seed is to be drilled.

Fungicidal versus fungistatic, S. E. A. MCCALLAN and R. H. WELLMAN (*Contrib. Boyce Thompson Inst*, 12 (1942), No. 6, pp. 451-463, figs. 4).—Fifteen water-soluble chemicals were compared by methods described as to their fungicidal (lethal) and fungistatic (inhibitory) effects on spores of *Sclerotinia fructicola*, *Alternaria solani*, *Penicillium expansum*, and *Rhizopus nigricans*. Fungicidal activity cannot exceed fungistatic activity, hence the correlation between the two is high when both values are either high or low, but when fungistatic activity is high and fungicidal activity low the correlation is poor. For all four fungi the

detailed results are presented. In a few cases, addition of a small amount of unfiltered orange juice markedly lowered the fungicidal action. The fungicidal dosage response curves gave straight lines when plotted on logarithmic-probability paper. In many cases the fungicidal curves were decidedly flatter than the corresponding fungistatic curves, outstanding examples being copper sulfate, potassium dichromate, uranyl acetate, sodium arsenate, malachite green, berberine sulfate, and 8-hydroxyquinoline sulfate. Limited data indicate that the fungicidal time-response curves give straight lines when plotted on logarithmic-probability paper.

Non-sterile soil as a medium for tests of seed germination and seed-borne disease in cereals, J. E. MACHACEK and H. A. H. WALLACE (*Canad. Jour. Res.*, 20 (1942), No. 11, Sect. C, pp. 539-557).—Large seedbed trials indicated that if maintained in proper condition nonsterile soil could be used successfully for tests of seed germinability and of certain kinds of seed-borne cereal diseases. It was more easily handled than autoclaved soil, did not require fresh preparation for each planting, and the amount of soil-borne seedling infection was negligible when the soil was kept friable, moist, and at 20° C. Results from 120 seed lots indicated nonsterile soil to be equal in some respects and superior in others to seed tests on moist filter paper or on nutrient agar in petri dishes for testing seed germinability, seed-borne disease, and physical injury to the seed. With barley, a plating test in addition to the soil test proved necessary to indicate the amount of seed-borne *Helminthosporium teres*. A table of tentative recommendations based on tests of several thousand seed lots is given. Seed disinfection is recommended where the smut spore load exceeds 1:128,000, or where seed decay or seedling blight reduces the healthy seedlings from nondisinfected seed below 91 percent. Increases in seedling rates are recommended when the healthy seedlings, even after disinfection, are less than 91 percent but more than 50 percent. Seed germinating 50 percent or less after disinfection should be discarded.

Chemical seed treatments for cereals and war needs, W. CROSTER (*Farm Res. [New York State Sta.]*, 9 (1943), No. 1, pp. 12-13).—Replacing critical war materials, Spergon and Thiosan are reported effective against stinking smut of wheat but not against oats or barley smuts. Oats smut control still requires New Improved Ceresan and to a greater extent than previously.

Environmental relationships in a seed-borne disease of barley caused by *Helminthosporium sativum* Pammel, King, and Bakke, H. W. MEAD (*Canad. Jour. Res.*, 20 (1942), No. 11, Sect. C, pp. 525-538).—The experiments reported indicate that greatest seedling injury occurs under conditions unfavorable to the host, viz, high temperature and excessive moisture or low temperature and scant moisture, and that greatest recovery occurs at 15°-18° C. in moist soil. It was further shown that packing and fertilization of the soil increases the amount of infection though fertilization may increase the dry weight of the seedlings, that the soil microflora has little influence on the seed-borne parasite, that reduction of the O₂ content of a nutrient solution or of the soil from 21 to 10 percent depresses seedling growth and amount of infection, and that adding 1 percent CO₂ to the soil atmosphere increases the amount of seedling infection. Barley infected with *H. sativum* should thus be sown in cool, moist, well-aerated soil. There are 23 references.

An American oat disease found in western Anatolia, H. BREMER (*Phytopathology*, 33 (1943), No. 2, pp. 165-167, figs. 2).—A leaf spot discovered in plots of fall-sown oats in an experimental field of the Plant Protection Station at Bornova (near İzmir), western Anatolia, is shown to be identical in symptoms

and cause (*Pseudodiscosia avenae*) with a disease observed in the United States. It was at first assumed that the fungus might have been introduced from the United States, but subsequent research admits the possibility that it may be indigenous to Turkey.

Das Vorkommen und die Verbreitung der in Rumänien den Weizenstinkbrand hervorbringenden Tilletia-Arten [The occurrence and distribution in Rumania of the wheat bunt fungi], T. SĂVULESCU, A. HULEA, and A. STĂNESCU (*Phytopathol. Ztschr.*, 14 (1942), No. 2, pp. 148-187, figs. 7).—Four species are said to be represented, viz, *T. tritici*, *T. levis*, *T. triticoides* and *T. intermedia*.

Cercosporella herpotrichoides Fron., causing eyespot of wheat in Great Britain, M. D. GLYNNE (*Ann. Appl. Biol.*, 29 (1942), No. 3, pp. 254-264, pl. 1).—A general account, including its history in England, its relation to lodging and to previous crops, and the losses involved.

Physiologic races in Urocystis tritici, C. S. HOLTON and A. G. JOHNSON. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 2, pp. 169-171).—Of the two races segregated, No. 1 (from Kansas) attacked Baart Federation, Oro × Federation-1 and Oro × Federation-26, but not Oro × Federation-38 or Oro × Federation-40, whereas No. 2 (from Washington State) attacked all of these wheat varieties and strains.

Influence of borax and potash on alfalfa yellows, J. B. WASHKO (*Tennessee Sta. Cir.* 83 (1943), pp. [4]).—Demonstrations in various parts of Tennessee indicated that alfalfa yellows (due to B or K deficiencies, leaf spot fungi, powdery mildew, leafhoppers, or aphids) is of common occurrence there, B deficiency apparently being the most important cause. Application of borax at 20 lb. per acre alone, or in combination with potash (more beneficial), prevented the deficiency forms and increased hay yield, plant height, and longevity of stand.

The occurrence of amphispores in the leaf rust of bluegrasses, J. R. HARDISON. (Wash. State Col.). (*Mycologia*, 35 (1943), No. 1, pp. 79-82, figs. 2).—Amphispores, hitherto not reported for *Puccinia poae-sudeticac*, are described.

The reaction of varieties of Trifolium subterraneum to leaf rust (Uromyces trifolii (Hedw.) Lev.), K. L. HILLS (*Jour. Council Sci. and Indus. Res. [Austral.]*, 15 (1942), No. 4, pp. 272-274).—Experimental data indicated the reactions of the varieties tested to vary from highly resistant to very susceptible. Possible explanations of the incomplete agreement with results elsewhere are offered.

A Pythium stalk rot of corn, C. ELLIOTT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 66 (1943), No. 1, pp. 21-39, figs. 13).—Following periods of hot humid weather at Arlington, Va., stalk rot of the lower internodes developed spontaneously in plants of two inbred lines of yellow dent corn. *P. butleri* was isolated from the rotted tissue and caused typical symptoms on inbred lines when inoculations were made under conditions of high temperature and humidity. The fungus produced infection on both wounded and unwounded inoculated corn plants but did not attack the roots. Of the 13 inbred lines of dent corn tested, 4 proved susceptible and only Ill. Hy. and Ky. 13 were resistant. Cultures of *P. butleri* from rotted cornstalks rapidly rotted squashes and cucumbers. What appeared to be the same disease was observed in a commercial field of hybrid corn near Petersburg, Va.

Lightning injury to cotton, A. L. SMITH. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 33 (1943), No. 2, pp. 150-155, figs. 2).—Considerable variation in the general appearance of lightning-struck spots in cotton fields was observed, sudden killing in circular areas resulting in those more frequently encountered.

More difficult to diagnose were the somewhat indefinite and variable spots with delayed and dispersed appearance of symptoms, without noticeable centralized killing, and extending over areas as much as 300 ft. in diameter. Immediate killing results from collapse of tissues exterior to the xylem in stems and larger roots. Surviving plants almost invariably exhibit a collarlike enlargement at or just below the soil line where the plants are completely or occasionally partially girdled. This girdling is due to the killing of cortical and cambial tissues in a band usually about 0.5 in. wide. Other symptoms on survivors include irregular longitudinally elongated necrotic areas on the stems. *Rhizoctonia bataticola*, reported as parasitic on certain Asiatic cottons, frequently invades the lower stem and roots of lightning-injured upland cotton (*Gossypium hirsutum*) in Georgia. American upland varieties are compared with varieties of *G. herbaceum* proved relatively resistant to this fungus.

Influence of sulphur deficiency on metabolism of black mustard, S. V. EATON (*Bot. Gaz.*, 104 (1942), No. 2, pp. 306-315, fig. 1).—The main symptoms (among others) on *Brassica nigra* were the short plants, yellow-green color of the upper leaves, and the thin leaves and stems. The chemical composition of the S-deficient stems (detailed) seemed to be due mainly to the combined influences of proteolysis and poor reductase activity. The effects of S deficiency on plants in general are summarized and compared (17 references).

Sanidade dos batatais e trabalhos aplicados ao seu melhoramento [Potato diseases and their control], J. A. DESLANDES (*Bol. Min. Agr. [Brazil]*, 30 (1941), No. 9, pp. 1-39, figs. 25).—A general account with reference to Brazil, including the results of experimental work.

Inoculation tests of potato for resistance to Phytophthora, N. J. FEDOROVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 33 (1941), No. 1, pp. 73-75).—In seeking material as a basis for breeding potatoes resistant to late blight (*P. infestans*), two seasons' inoculations of a large number of varieties and seedlings of *Solanum demissum* indicated it to be a very polymorphous species, with wide ranges in susceptibility even among lines. Along with these inoculations, 22 varieties of *S. antipovichi* were also tested; a few forms were resistant, but most of them no more so than varieties of the cultivated potato. It is thus obvious that the choice of breeding material is not only important, but that every clone to be used must be thoroughly investigated.

Potato virus X: The average severity of strain mixtures in three varieties of potato, J. G. BALD and N. H. WHITE (*Jour. Council Sci. and Indus. Res. [Austral.]*, 15 (1942), No. 4, pp. 300-306, fig. 1).—A rapid method was evolved for inoculating this virus, the tuber itself being used both as inoculum source and instrument for inoculation. Populations of virus X strain mixtures carried in different lots of the same variety proved similar, but there were wide differences in strain mixtures carried by the three varieties used. A natural equilibrium among strains of each variety is suggested to explain these findings, and its relation to seed tuber selection is discussed.

Influencia de la infección de la soja con *Rhizobium japonicum*, sobre el rendimiento y calidad del forraje [Influence of soybean infection with *R. japonicum* on the yield and quality of the fodder], E. SCHIEL and P. R. MARCO (*Rev. Argentina Agron.*, 9 (1942), No. 4, pp. 284-291, fig. 1; *Eng. abs.*, p. 291).—Two field trials were conducted with soybeans on common and on rich soils, a part of the seed in each case having been previously inoculated. On the common soil the greatly increased yield from inoculation was highly significant; on the rich soil *R. japonicum* increased only the percentage of nitrogen.

Observaciones y ensayos culturales relacionados con el "carbon" de la caña de azúcar [Observations and culture trials with sugarcane smut],

W. E. CROSS (*Bol. Estac. Expt. Agr. Tucumán, No. 37 (1942), pp. 12*).—The present study of this fungus disease, first observed in Tucumán during the crop season of 1940–41, was continued at the experiment station through November 1942. Lists of varieties severely, moderately, and only slightly infected are given. Intensity of attack proved to have no relation to age of cane, date of harvesting of the preceding crop, fertility of the soil, presence of other cane diseases, degree of infestation with the cane borer, or chemical composition of the cane. Frequent irrigation in spring increased the number of shoots attacked. Climatic conditions exercised an important influence on the incidence of smut. Severe frosts at the end of winter and prolonged droughts in spring weaken the cane and occasion much delay in its development; these factors are believed to contribute to the progress of the disease. Possible control methods tried, including heavy manuring and liming and adding various chemicals to the soil, all gave negative results.

Nutritional effects of boron on growth and development of the sunflower, B. LOWENHAUPT (*Bot. Gaz., 104 (1942), No. 2, pp. 316–322*).—The plants showed typical B-deficiency symptoms on transfer from a complete nutrient solution to one deficient in boron or to distilled water. Boron proved necessary to stem-tip or root growth. Leaves were heavier if plants were deprived of B during the later part of their growth period. In the minus-B plants the stem tips were lower in ash, and the ash of the leaves contained more Ca though the stem, roots, and the entire plant contained less. Boron is believed instrumental in regulating the distribution of materials throughout the plant, and the Ca determinations confirm the view that there is a relationship between B availability to the plant and the utilization of Ca. There are 20 references.

Bacteriological sterility of tissues derived from secondary crown-gall tumors, A. C. BRAUN and P. R. WHITE (*Phytopathology, 33 (1943), No. 2, pp. 85–100, figs. 2*).—The results from over 2,000 tests are presented. No cultures from viable secondary tumor tissues from sunflower yielded cultures of *Phytomonas tumefaciens* when growth on nutrients suitable for its isolation, when thoroughly crushed and incubated in suitable nutrients, or when cut in thin slices and incubated on media known to favor growth of this pathogen. Special tests suitable for isolating small numbers of bacteria or of dormant phases, filtrable forms, viruses, or noncultivable forms were also negative. Implantation of such tumor-tissue cultures in sunflower and artichoke plants gave rise to typical crown-gall tumors that again failed to yield *P. tumefaciens* on the usual tests. Used as antigens, tumor-tissue cultures failed to reveal the organism either by agglutination or complement-fixation tests. These data are believed to provide unequivocal demonstration that tumor-tissue cultures isolated from secondary tumors are entirely free of *P. tumefaciens* or of other recognizable tumor-inciting agents. It is therefore assumed that the causal agent of crown-gall in the sunflower produces a profound change in the characteristics of certain host cells resulting in a subsequent independent, unrestrained, unphysiologic, and potentially malignant type of development. These bacteria-free crown-gall tumor cells possess many of the essential characteristics of true malignant animal cells and thus represent a potentially useful material with which to study certain basic principles involved in the etiology of malignancy.

Peronospora tabacina Adam, the organism causing blue mold (downy mildew) disease of tobacco, E. E. CLAYTON and J. A. STEVENSON. (*U. S. D. A.*). (*Phytopathology, 33 (1943), No. 2, pp. 101–113, fig. 1*).—In studying identification methods for *Peronospora* spp., it was found that different collections of *P. tabacina* spores vary significantly in size and that this variability is increased by collecting from different hosts. The authors' measurements were

made under very uniform conditions, but when reports by others were considered the variability was still more pronounced. Mean values for conidial size were at least 17μ – 28μ by 13μ – 17μ , a range too great to permit definite identification by measurements alone. The oospores were still more variable, and the only possible value in measuring them would be to determine whether they lie within the size range for the genus (about 20μ – 60μ). Neither conidiophores, conidia, nor oospores possess morphological characters distinctive for species determination. Evidence is offered that the situation in *P. tabacina* is representative of that for the genus, in that spore measurements have not provided a sound basis for species identification. The Peronosporaceae are apparently highly specialized with respect to parasitism, and *P. tabacina* is practically limited to *Nicotiana*. Pathogenicity thus appears to be the only definite basis for identifying *P. tabacina*, and it is believed to be the only species occurring on *Nicotiana*. It is thought to be native to all temperate zone regions with native *Nicotiana* floras, i. e., portions of North and South America and Australia. There are 22 references.

Some effects of sand and nutrient supply on a physiological leaf spot of cantaloupe, E. C. PIERCE and D. L. STODDARD. (Md. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 2, pp. 162–164).—A physiological leaf spot inducing progressive defoliation of cantaloups grown in quartz sand was inhibited by use of coarser sand and slop application of nutrients. Root aeration appeared to be the factor involved.

Cercospora blight of carrot, H. R. THOMAS. (Ind. Expt. Sta. coop. Univ. Calif.) (*Phytopathology*, 33 (1943), No. 2, pp. 114–125, figs. 2).—*C. carotae* attacks leaf blades and petioles of *Daucus maritimus*, *D. pulcherrimus*, *D. pusillus*, *D. hispanicus*, and *D. gingidium*, as well as of carrot, and no marked resistance was found among *Daucus* spp. or 112 carrot varieties and selections tested in the field. The fungus germ tubes enter through stomata and advancing hyphae are intercellular at first, but intracellular invasion soon follows. The pathogen grew equally well in culture at 19° – 28° C. It may persist in the soil from one crop to another and may be spread by the wind. Infected inflorescences have been observed and viable conidia found on seed from such plants, but seed transmission is deemed unimportant. Carrot seed artificially contaminated with conidia and treated with ethyl mercury phosphate or ethyl mercury tartrate as liquids (1–24,000) or dusts, mercuric chloride (1–1,000), or Sperguson remained free of fungus growth when placed on sterile potato-dextrose agar. The number of leaf spots per square centimeter of leaf surface did not differ significantly among carrots sufficient in N, P, and K or deficient in K or P. Ca- and N-deficient plants developed significantly fewer leaf spots per square centimeter than complete nutrient plants. Leaf spots attained their greatest length on complete-nutrient plants, were intermediate on K- and P-deficient plants, and shortest on Ca- and N-deficient plants. More fungus growth was obtained on leaf extracts from complete and K- and N-deficient plants than on extracts from Ca- and P-deficient plants.

Notes on hop diseases in 1941, W. G. KEYWORTH (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 29 (1941), pp. 42–43).—Notes are presented on outstanding features of attacks by *Verticillium* wilt, nettlehead (probably virus induced), fluffy tip (cause unknown), and virus chlorosis and mosaic diseases.

The grey mould of fruit and hops: Weeds as possible source of infection, H. WORMALD (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 29 (1941), pp. 44–47).—In 1941 *Botrytis cinerea* was found prevalent during the first half of June and in the fall on many cultivated plants as well as on a number of weeds. It was particularly abundant on the flower heads of members of the composite family.

Varietal resistance and mulching show promise in control of tomato fruit rot, W. A. KREUTZER and L. R. BRYANT (*Colo. Farm Bul. [Colorado Sta.], 5 (1943), No. 1, pp. 12-15, fig. 1*).—In tests of 119 types and varieties against the *Phytophthora capsici* rot, a disease threatening serious curtailment of the war-important canning crop in at least two of the largest Colorado tomato areas, none of the commercial sorts showed complete but some a certain degree of resistance. Fruits of all varieties and types not in contact with the ground were seldom infected under test conditions. In field tests with a heavy straw mulch there was a marked reduction in infection of fruits on the straw as compared with those in contact with the soil. Field tests with copper fungicides failed to yield the promise shown by laboratory tests, but under conditions enabling spread to fruit above the ground they may still offer possibilities.

New spray controls anthracnose of tomato fruit, G. L. McNEW (*Farm Res. [New York State Sta.], 9 (1943), No. 1, pp. 6, 7, figs. 2*).—In the two preliminary tests reported Ferimate (ferric dimethyl-dithio-carbamate), with nearly 99 percent perfect control, was far and away the most effective of several fungicides tried.

The presence of a toxin in tomato wilt, D. GOTTLIEB. (*Minn. Expt. Sta. (Phytopathology, 33 (1943), No. 2, pp. 126-135, figs. 5)*).—Using a method devised for anaerobic collection of vascular fluids, tomato plants wilted by *Fusarium bulbigenum lycopersici* were found to contain a toxin in their tracheal fluids, whereas no toxins were noted in those wilted by insufficient soil water. When the cell sap of either healthy plants or those with *Fusarium* wilt was expressed from the stems under aerobic conditions, a poisonous substance was present that caused tomato seedlings to wilt when placed in the sap. There are 20 references.

Spray trial to control spotted wilt of tomatoes, T. T. COLQUHOUN (*Jour. Austral. Inst. Agr. Sci., 8 (1942), No. 4, pp. 171-172*).—Spraying with tartar emetic reduced the incidence of this virus disease in the treated plots, but it is questioned whether in view of the 30 percent of infection developing therein, this could be considered control. See also a previous note by Magee et al. (*E. S. R., 88, p. 491*).

Heat resistant microorganisms causing spoilage in the 1942 tomato pack, J. A. WOERZ and D. J. LENANE (*Canner, 96 (1943), No. 10, pp. 11-12, 24*).—Anaerobic rod-shaped spore-forming bacteria from the soil were found to be involved.

Extent of injury to fruit trees during the winter of 1941-42 and what can be done about it, N. L. PARTRIDGE (*Michigan Sta. Quart. Bul., 25 (1943), No. 3, pp. 255-263, figs. 2*).—Supplementing a previous report (*E. S. R., 87, p. 767*), fruit tree injury in 1942 proved to be of two types: (1) Bark killing on trunk, collar, and large crotches owing to immaturity of wood, and (2) wood injury resulting in blackheart. Though weather conditions were primarily responsible on peach, cherry, and apple, the first type occurred on soils or under management conditions indicating late growth in the fall. These were the most fertile soils, which were naturally moist. The contributory management practices were those that failed to supply a vigorously growing cover on the stronger soils in the fall. Blackheart occurred in peach trees subjected to -12° F. or lower. Serious injury was associated with trees making weak growth in 1941-42, on dry infertile soils or those made infertile by sheet erosion. Trees making moderately vigorous growth showed the best survival, and soils should be selected or managed to obtain that type of growth if winter injury is to be kept low.

The maturation and discharge of ascospores of the apple scab fungus in Indiana and its significance in control of scab, R. C. BAINES (*Indiana Sta. Bul. 471 (1942), pp. 13, figs. 6*).—On the basis of present findings it is deemed

reasonable to predict that mature ascospores of *Venturia inaequalis* will be present each spring when young leaves appear on the trees and that they will be discharged during rainy periods until some time after the calyx stage. Ascospores matured first in southern Indiana and progressively northward, dates varying with the season and climatic conditions. Discharge occurred over 8 weeks or more, and the proportion discharged by the calyx stage of fruit development depended on the frequency and duration of rains and the time required for the trees to pass through the early growth stages. The location of overwintering leaves in the orchard apparently had little effect on the date of ascospore maturity. Ascospore maturity dates on leaves of 11 apple varieties exhibited no significant differences.

Peach-suture spot, E. M. HILDEBRAND. (Cornell Univ.). (*Phytopathology*, 33 (1943), No. 2, pp. 167-168, fig. 1).—A new disease of unknown cause affecting only the fruit was found in a New York State Elberta orchard. The suggested name refers to the striking spot lesions in the suture region, readily distinguishable from red suture virosis because they become dry and corky with age. The lesions appear when the fruits approach maturity, are usually oblong in shape, and extend from the surface to the pit. Diseased fruits drop, and affected trees may be located by their presence on the ground.

Stamen blight of blackberries, S. M. ZELLER and A. J. BRAUN. (Oreg. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 2, pp. 136-143, figs. 3).—This disease, due to *Haplospheeria deformans* and first observed in Oregon on dewberries (1937) and on wild trailing blackberry (*Rubus macropetalus*), was found to infect the anther walls and form a pseudoparenchymatous envelope completely surrounding the pollen sac. Pycnidia formed thereon erupt on the surface ready to discharge coils of pycniospores when the flowers open. Between May and the following March infection takes place through the axillary buds. A perfect stage of the fungus has not been found. No control was afforded by dormant sprays (January-March) of bordeaux or lime-sulfur, but the latter applied in August gave indication of about 60 percent control. Commercial varieties affected in Oregon are Boysen and Young dewberries and Evergreen blackberries.

Decline disease of raspberry, S. M. ZELLER and A. J. BRAUN. (Oreg. Expt. Sta.). (*Phytopathology*, 33 (1943), No. 2, pp. 156-161, figs. 3).—This Cuthbert red raspberry disease, causing the decline of large areas on commercial plantings in the Willamette Valley, Oreg., presents no particular symptoms except a gradual dwindling in vigor of canes and roots along with some leaf rolling and fluting in late fall. In the greenhouse this leaf roll is characteristic throughout the season. The disease, considered due to a virus, has been transmitted by bud grafting but no insect vector has yet been found. *Minuor ruborum* is the suggested binomial, with *Rubus* virus 8 as the numerical designation.

Strawberry leaf blotch, H. WORMALD and H. B. S. MONTGOMERY (*East Mall-ing [Kent] Res. Sta. Ann. Rpt.*, 29 (1941), p. 44).—A strawberry leaf blotch, probably due to *Phyllosticta grandimaculans*, is reported for the first time in Great Britain.

Red stele root rot of strawberries: Serious new disease curtails strawberry production, D. CATION, C. A. BOYER, and C. W. ROBERTSON (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 233-242, figs. 2).—The *Phytophthora fragariae*-induced red stele, first reported for Michigan in 1937, is now well established and considered the most serious strawberry disease in that and other northern and eastern States. Pertinent information concerning it is here summarized. Because even long-period rotation is of questionable value, current control must consist in use of healthy stock on noninfested soil. Ultimate control will rest

largely on the development of resistant varieties, which it is expected will soon replace those now grown.

Witches' broom disease investigations.—III, Notes on the occurrence of witches' broom disease of cacao at River Estate, 1939-1942, R. E. D. BAKER (*Trop. Agr. [Trinidad]*, 20 (1943), No. 1, pp. 5-12).—Continuation of a series (E. S. R., 88, p. 494).

El "ojo de gallo": Enfermedad del cafeto [The "cock's-eye" disease of coffee], R. P. ROBÁ (*Nicaragua Min. Agr. y Trab. Bol.* 7 (1940), pp. [1]+14, figs. 5).—This spot disease of the leaves and berries, due to *Omphalia flavidia* and said to be one of the most injurious maladies of coffee in Nicaragua, is here described and discussed relative to its geographical distribution and propagation, the factors favoring it, and methods of control.

Preventing the bacterial oxidation of rubber, A. E. DIMOND and J. G. HORSFALL. (Univ. Nebr. and Conn. [New Haven] Expt. Sta.). (*Science*, 97 (1943), No. 2510, pp. 144-145).—The accelerators mercaptobenzothiazole and tetramethylthiuram disulfide (each by itself active against fungi) are intimately mixed with zinc oxide in the compounding of rubber. Tests here reported indicate that when compounded with zinc oxide the first becomes inactivated as a fungicide, whereas the second does not. It thus seems clear that when rubber is to be subjected to conditions favoring microbiological disintegration tetramethylthiuram disulfide is the accelerator of preference.

Progress report on soil applications of zinc sulphate in the control of rosette of pecan, A. O. ALLEN and H. E. HAMMAR. (U. S. D. A.). (*Tex. Pecan Growers Assoc. Proc.*, 21 (1941), pp. 63-70).—Results to date suggest very little benefit the same season from soil applications of $ZnSO_4$ on alkaline, neutral, or slightly acid substrates but that heavier applications than have been generally used show promise of overcoming rosette on some soils. Results from use of sulfur and manure along with the $ZnSO_4$ were encouraging and showed more promise than heavy applications of the salt alone, but further work is needed before recommendations can be made.

An improved method in the direct treatment of rosette with sulphate, A. WINKLER (*Tex. Pecan Growers Assoc. Proc.*, 21 (1941), p. 59).—A piece of iron pipe is inserted in the hole through which the $ZnSO_4$ is applied, thus permitting re-treatments at any time.

Duration of the effect of zinc sulphate treatment on large, badly rosetted pecan trees, A. C. GOSSARD and H. E. PARSON. (U. S. D. A.). (*Southeast. Pecan Growers Assoc. Proc.*, 35 (1941), pp. 31, 33, 35-36).—Marked improvement in rosette symptoms for one or more years as compared with untreated trees followed soil applications (1) and tree injections (2) of $ZnSO_4$, being more rapid but less pronounced in the latter case. In (1), after 4-5 yr., the symptoms had gradually increased to a mildly rosetted condition. However, an apparent slow improvement of the untreated trees seemed to be a contributing factor in lessening the final differences between treated and control trees, possibly due to a liberation of small amounts of zinc from the oystershell meal used as a soil dressing. At the end of the experiment the injected (2) and control trees had attained about the same severity and quantity of rosette, differences being scarcely discernible.

Leaf variegations of perennial delphiniums, H. H. P. SEVERIN (*Hilgardia [California Sta.]*, 14 (1942), No. 10, pp. 571-582, pls. 2, fig. 1).—Variegations for which the names "golden-leaf" and "silver-leaf" are proposed proved to be seed-borne but nontransmissible by aphids (10 species tested) or by juice inoculations. Variegation was sometimes associated with calico or aster yellows infections (one or both) in the same plant, but although these infections were

readily transmitted the variegation was not. It is concluded that these variegations are not virus diseases.

The susceptibility of perennial delphiniums to six viruses, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 14 (1942), No. 10, pp. 549-570, pls. 6, figs. 2).—Perennial delphinium was shown to be infected spontaneously with tomato spotted wilt, which ranks next in seriousness to aster yellows in the central-coastal regions of California, and also with a virus complex including spotted wilt and celery calico. Varieties and hybrids were experimentally infected with common and western cucumber mosaics (systemic types), tobacco ring spot (systemic) and ordinary tobacco mosaic (local). Orange larkspur (*Delphinium nudicaule*), a native perennial, was previously reported as a symptomless carrier of curly top (E. S. R., 76, p. 818), and Wrexham delphinium proved immune to it.

The nature of the mosaic disease of bandakka (*Hibiscus esculentus* L.), M. FERNANDO and S. B. UDURAWANA (*Trop. Agr.* [Ceylon], 98 (1942), No. 1, pp. 16-24, pls. 2).—The evidence suggests that this okra disease is due to a virus, transmitted by budding but thus far not by seed.

Viroses of annual larkspurs, H. H. P. SEVERIN (*Hilgardia* [California Sta.], 14 (1942), No. 10, pp. 583-594, pls. 2).—Annual larkspurs (delphiniums) were shown to be spontaneously infected with California aster yellows, celery calico, and curly top, and were experimentally infected with western cucumber mosaic.

Some virus diseases of Stachytarpheta, C. A. LOOS (*Trop. Agr.* [Ceylon], 98 (1942), No. 1, pp. 8-12, pls. 2).—Mosaic, rosette, and yellow vein banding are included.

Additional records of violet scab, A. E. JENKINS. (U. S. D. A.). (*Phytopathology*, 33 (1943), No. 2, pp. 168-169).—Violet scab (*Sphaceloma violae*) is reported from Massachusetts, Connecticut, North Carolina, Mississippi, and Texas. new susceptibles being *Viola jooi*, *V. priccana*, *V. vilmoriniana*, and white-flowered *V. odorata*.

Phytophthora crown and root rot, P. A. MILLER. (Univ. Calif.). (*Natl. Shade Tree Conf. Proc.*, 18 (1942), pp. 320-325).—On the sudden decline and death of various ornamental trees and shrubs caused by *Phytophthora* in the California coastal region, including a description of the symptoms and discussion of prevention and control.

Fomes annosus and red cedar, J. K. MILLER (*Jour. Forestry*, 41 (1943), No. 1, pp. 37-40).—Suppression of *Juniperus virginiana* from competition for light by overtopping tree species renders it susceptible to attack by this fungus. Little loss from *F. annosus* may be anticipated on suitable sites exposed to full sunlight.

Taxonomy, distribution, and pathology of *Phomopsis occulta* and *P. juniperovora*, G. G. HAHN. (U. S. D. A. et al). (*Mycologia*, 35 (1943), No. 1, pp. 112-129, figs. 2).—The heightened interest in eastern red cedar (*Juniperus virginiana*) for conservation and ornamental plantings has focused attention on its diseases. Because of the close morphological similarity of the saprophyte *P. occulta* to the destructive nursery parasite *P. juniperovora* on this host, the distribution of the two fungi has been confused. In comparable wound inoculation tests in an unheated greenhouse, *P. occulta* proved unable to attack any of the 14 wildling cedar saplings used, corroborating similar tests on Arizona cypress and Chinese arborvitae; all 7 trees inoculated with *P. juniperovora* became infected. In cultures, neither the yellow color nor the flaming orange crystals of the latter fungus appeared in *P. occulta*, thus serving to differentiate the two species with overlapping spore size ranges. A detailed discussion is presented of the taxonomy, distribution, and pathogenicity of these related fungi. *P. occulta* is to be regarded as a secondary fungus on cedars following injury by other causes. *P. juniperovora* under natural conditions parasitizes only mem-

bers of the Cupressaceae (revised host list included) and, unlike *P. occulta*, its *Diaporthe* stage is unknown. There are 19 references.

Powdery mildew of the coast live oak, P. A. MILLER. (Univ. Calif.). (*Natl. Shade Tree Conf. Proc.*, 18 (1942), pp. 358-366, figs. 3).—A progress report (E. S. R., 88, p. 359) summarizing 2 years' further study and observation by the author of the disease of *Quercus agrifolia* due to *Sphaerotheca lanestris*, and 3 years' control trials (pruning, spraying, and selection and propagation of resistant trees).

Mimosa wilt—a major problem, G. H. HEPTING and E. R. TOOLE. (U. S. D. A.) (*Natl. Shade Tree Conf. Proc.*, 18 (1942), pp. 254-258).—This is an account of the present status of *Fusarium* wilt of *Albizia* spp., now known from North Carolina to Florida, and including a summary of experimental work by the authors. Some promise of resistance in individual trees was found.

A canker of eastern pines associated with *Atropellis tingens*, J. D. DILLER. (U. S. D. A.). (*Jour. Forestry*, 41 (1943), No. 1, pp. 41-52, figs. 7).—A twig- and branch-girdling canker caused considerable flagging in crowns of native and exotic pines in the eastern United States, 1933-34. Although formerly suspected as being an introduced disease, because first observed on exotic species (1932), later surveys indicated it to be widespread in the East, occurring on 17 pine hosts. The disease is primarily one of saplings, though all size classes may be attacked. The pine spittle bug (*Aphrophora parallela*) was ruled out as involved and the fungus *Atropellis tingens* shown to be the cause. The evidence, including 7 yr. of field observations, indicates that the damage has been minor, even in the epidemic seasons only an occasional suppressed seedling in an overstocked stand of natural reproduction being killed. A recurrence of the epidemic under favorable conditions may be expected, but no control measures are considered necessary.

Importance of fungi and defects in handling Alaskan airplane spruce, D. V. BAXTER and R. W. VARNER (*Mich. Univ., School Forestry and Conserv. Cir.* 6 (1942), pp. 35, pls. 9).—Prominent among woods valued for airplane stock is that of Sitka spruce (*Picea sitchensis*), and it is currently important that the output be increased and delivered in the best possible condition. To aid in carrying out these activities the authors discuss the occurrence of the species in Alaskan forests, the common fungi encountered thereon, the growth of certain of them in culture, a key for the identification in culture of certain northern North American fungi causing defects, and problems in handling airplane stock with recommendations pertaining thereto.

Characteristics and significance of white floccose aggregates in the wood of western hemlock, B. L. GRONDAL and A. L. MOTTET (*Wash. Univ. [Seattle], Forest Club Quart.*, 16 (1942-43), No. 1, pp. 12-18, figs. 4).—These aggregates, occurring especially in the so-called "sinker" type of heartwood and here termed "floccosoids" bear only a remote resemblance to the white pockets due to *Trametes pini*, a fungus commonly attacking coniferous timber of various species. As a result of detailed microscopic examination and pathological and microchemical tests, it appears highly improbable that the presence of these floccosoids has any effect on the strength of the wood, and on the basis of all existing evidence wood containing them should be acceptable in all aircraft grades. A practical method of differentiating the floccosoids from the white specks or spots due to decay is given.

Decay in Douglas fir cork and studies in the cultural identification of fungi causing decay in western hemlock and Douglas fir, C. E. SELISKAR (*Wash. Univ. [Seattle], Forest Club Quart.*, 16 (1942-43), No. 1, pp. 4-11, fig. 1).—Decay in Douglas fir bark, a rich source of valuable cork, occurs as

small hollow areas scattered throughout which might be mistaken for insect injury but which circumstantial evidence indicates is due to fungus infection. Besides bacterial contamination, four fungi—*Mortierella simplex*, *Dematium* sp., *Chalara* sp. (?), and an unidentified basidiomycete—were consistently isolated. The first three gave no indications of a causal relation, but the last appeared to be associated with the decay. Details of the further study on cultural identification of fungi causing wood rots in western hemlock and Douglas fir are discussed, including the general plan and some of the problems encountered.

Principal decays of British hardwoods, K. S. CARTWRIGHT and W. P. K. FINDLAY (*Ann. Appl. Biol.*, 29 (1942), No. 3, pp. 219-253, pls. 5).—The principal wood-rotting fungi on the more common broadleaved trees are listed with notes on their occurrence and relative importance, and the results of tests on natural resistance to them are tabulated. The principal diagnostic features of the more important fungi attacking ash, beech, elm, willow, and fallen hardwoods generally are also set forth in tables. Finally, detailed descriptions with further available information are given for 16 fungus species. There are over two pages of references.

On *Fusarium equiseti* (CDA) Sacc. (= *Fusarium falcatum* App. et Wr.) causing a leaf-spot disease of *Eichhornia crassipes* Solms, I. S. BANERJEE (*Jour. Dept. Sci., Calcutta Univ., n. ser.*, 1 (1942), No. 3, pp. 29-37, pl. 1, figs. 35).—Successful isolation from common water-hyacinth leaves and infections from culture are reported.

An undescribed *Lagenidium* parasitic upon *Potamogeton*, V. M. CUTTER, JR. (Cornell Univ.). (*Mycologia*, 35 (1943), No. 1, pp. 2-12, figs. 21).—*L. muenschleri* n. sp. is described as causing a hypertrophy of the root hairs on *P. spirillus*.

Os nematóides e os meios usuais para o seu controle [Nematodes and usual methods of control] J. SOARES BRANDÃO, JR. (*Bol. Min. Agr. [Brazil]*, 30 (1941), No. 7, pp. 9-15).—Lists of plants susceptible and resistant to root knot are included.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Food of some Utah birds, J. S. STANFORD and G. F. KNOWLTON. (Utah Expt. Sta.). (*Auk*, 59 (1942), No. 4, pp. 580-581).—Brief records are given of the insect food contents of stomachs of 10 species of birds collected in Utah and examined during the season of 1941.

College entomology, E. O. ESSIG (*New York: Macmillan Co.*, 1942, pp. VII+900, [pl. 1], figs. 308).—Following the first three chapters of this work, which deal, respectively, with metamorphosis, anatomy, and classification of insects, 33 orders are considered in as many chapters. A key (or keys), together with a list of selected references to the literature, accompanies many of the chapters, and a general list of handbooks, etc., relating to entomology is appended.

[Contributions on economic entomology] (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 955-963).—Contributions prepared for presentation at the annual meeting of the American Association of Economic Entomologists, abstracts of which are given, include: Azobenzene as a Control for Chiggers in Lawns, by D. M. DeLong and E. D. Witman; Insects Attacking Belladonna in Pennsylvania, by C. A. Thomas; The Mosquito Problem in North Dakota, by J. A. Munro and H. S. Telford; A Comparative Study of Several Methods of Sampling Adult Mosquito Populations, by C. B. Huffaker and R. C. Back; Ox Warble, *Hypoderma lineata* (de Villers), Control in Range Cattle, by M. A. Stewart; Capacity of Insects to Ruin the Protection Offered Foods by Various Types of Containers, by E. A. Back; The Tomato Russet Mite *Phyllocoptes destructor* Keifer—Its Present Status, by S. F. Bailey and H. H. Keifer; The Effects of Sulfur Residue Upon the Keeping

Qualities of Canned Tomato Products—a Preliminary Report, by G. M. List; Substitutes for Tartar Emetic and Brown Sugar in the Control of the Gladiolus Thrips, by F. F. Smith; The Insecticide Requirements of California Crops, by S. Lockwood; Laboratory Studies of Acrylonitrile, Chloropicrin, Methyl Bromide, and Other Fumigants Against the Bedbug, by H. H. Richardson; Toxicity of Alpha, Beta-Dibromo-Beta-Nitroethyl Benzene to Houseflies, by E. R. McGovran, M. S. Schechter, and J. H. Fales; Concentrated Spray Experiments, by L. P. Ditman, H. S. McConnell, and E. N. Cory; The Relative Resistance of *Periplaneta americana* L. and *Blattella germanica* L. to Pyrethrum Spray, by E. R. McGovran, J. H. Fales, and P. G. Piquett; Cause of an Infestation by *Tribolium confusum* of Rolled Oats Packaged in Three-Pound Cardboard Cartons, by E. A. Back; The Toxicity of Ethide to the Firebrat and Three Species of Stored Grain Insects, by J. M. Grayson and E. W. King; The Present Status of Basic Copper Arsenate as an Insecticide and Fungicide, by H. A. Waters, D. M. DeLong, and E. D. Witman; Further Studies of Sulfur in Combination With Other Materials for the Control of *Empoasca* Leafhopper and Tarnished Plant Bug on Alfalfa, by G. L. McCall and D. M. DeLong; Reversals in Order of Effectiveness of Insecticides, by N. Turner; Factors Determining the Regression of the European Corn Borer (*Pyrausta nubilalis* Hbn.) in Quebec, by G. Maheux and G. Gauthier; The Significance of Growth Stages of Sweet Corn as Related to Infestation by the European Corn Borer, by R. L. Beard; The Ultimate Water Soluble Arsenic Value, by E. D. Witman, H. A. Waters, and E. R. Rothenich; Control of Aphids and Diamond-Back Moth Larvae on Collards With Rotenone-Nicotine Dusts, by H. G. Walker and L. D. Anderson; Ethylene Dichloride Treatments for the Control of the Immature Stages of the Japanese Beetle, by A. C. Mason and R. D. Chisholm; Treatment of Elm Logs to Prevent Bark Beetle Entry, Breeding, and Emergence, by D. P. Connola, L. E. Hagmann, and D. L. Collins; Developments in Research on the Bark Beetle Vectors of the Dutch Elm Disease Fungus, by C. W. Collins, R. R. Whitten, and R. T. Webber; The Application of Twig Clipping Supported by Certain Other Sanitary and Cultural Practices in the Control of the Oriental Fruit Moth, by G. E. Marshall; The Relation of Winter and Spring Temperatures to Injury of Peas by the Pea Aphid, by L. P. Ditman and E. N. Cory; Combination Rotenone-Nicotine Dusts for Pea Aphid Control, by J. H. Lilly; Tests on Bordeaux Mixture and Other Sprays for the Control of Japanese Beetle, by D. L. Collins and R. V. Nardy; Toxicity of 95 Synthetic Organic Chemicals to the Codling Moth, by E. D. Witman, B. C. Dickinson, H. A. Waters, and D. M. DeLong; A Simplified Method of Sampling Known Areas of Apple Leaves for Chemical Analysis, by F. H. Lathrop and B. E. Plummer; Stability of Basic Lead Arsenate With Spray Ingredients, by J. M. Ginsburg; The Economic Importance of the [Smaller] European Elm Bark Beetle, by E. P. Felt and S. W. Bromley; Some Factors Influencing Protective Stupefaction of the California Red Scale With Hydrocyanic Acid, by H. R. Yust, H. D. Nelson, and R. L. Busbey; The pH Values of the Alimentary Canal of Various Insects, by B. C. Dickinson and E. D. Witman; Experiments on the Control of *Limonius agonus* (Say) on Shade-Grown Tobacco in Connecticut, 1937-42, by A. W. Morrill, Jr.; Reduction of Flea Beetle Injury to Tomato Transplants by Treatment Prior to Setting, by T. C. Watkins and S. Logan; The Effect on Peach Trees of Ethylene Dichloride Emulsion as Used for Peach Tree Borer Control, by O. I. Snapp; Technique for Obtaining Accurate Exposure Times for Still and Movie Photomicrograph, by H. A. Waters; Lead Arsenate and Tricalcium Arsenate-Bentonite Combinations and Lead Arsenate-Zinc Sulfate-Summer Oil Emulsion Combinations as Sprays for the Control of Codling Moth, by R. L. Parker and P. G. Lamerson; Red Spider Mite [*Tetranychus telarius* L.] Control on Alfalfa in a Greenhouse by Certain New Organic Insecti-

cides, by R. L. Parker; Daily and Seasonal Behavior of Flies Around Unsprayed Cows as Shown by Hourly Fly Counts, by R. C. Smith; and *Sagaritis provancheri* (D. T.), an important Parasite of the Tobacco Budworm, by G. Wene.

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 938-949, figs. 2).—Contributions presented (E. S. R., 88, p. 498) are: A Major Outbreak of the Southwestern Corn Borer in Kansas, by D. A. Wilbur, H. R. Bryson, and R. H. Painter (pp. 938-939) (Kans. Expt. Sta.); Cube and Nicotine in the Control of *Phyllotreta vittata discedens* Weise, by M. J. Janes (pp. 939-940) (Tex. Sta.); The European Corn Borer in Iowa, by H. M. Harris and J. M. Brindley (pp. 940-941); A Preliminary Report of a Critical Examination of the Roots of *Derris elliptica*, by F. A. Gunther and F. M. Turrell (p. 941) (Calif. Citrus Sta.); Seasonal Insect Food of the Brown-Shouldered Uta (Lizard) [*Uta stansburiana stansburiana*], by G. F. Knowlton, W. D. Fronk, and D. R. Maddock (p. 942) (Utah Sta.); Some Parasites of *Heliothis armigera* (Hbn.) in Texas, by F. F. Bibby (pp. 943-944) (Tex. Sta.); Effects of High Temperature on Several Household and Storage Grain Pests, by E. E. Kenaga and F. W. Fletcher (p. 944); A Two-Season Light Trap Study of Mosquitoes in Colorado, by M. T. James (p. 945) (Colo. State Col.); Rice Stinkbug [*Solubea pugnax* (F.)] as a Pest of Sorghums, by R. G. Dahms (pp. 945-946) (U. S. D. A. and Okla. Sta.); Armyworm Habit of *Heliothis armigera* (Hbn.), by C. F. Rainwater (pp. 946-947), Methyl Bromide Fumigation of Refrigerator Trucks, by H. C. Donohoe and C. H. Gaddis (p. 947), and Two Economic Species of Mites [*Eriophyes caryae* Keifer and *Paratetranychus viridis* Banks] on Pecan, by C. B. Nickels (p. 948) (all U. S. D. A.); and The Term "Inverted Spray Mixture," by J. Marshall (pp. 948-949).

[Insect investigations by the Arkansas Station] (*Arkansas Sta. Bul.* 428 (1942), pp. 36-41, 52-53).—A progress report (E. S. R., 88, p. 72) of work by W. J. Baerg and D. Isely, noting control of strawberry insect damage, spot dusting to control the boll weevil, control of corn earworm in sweet corn, and the control of rice field mosquitoes.

[Investigations in economic entomology by the Oklahoma Station]. (Partly coop. U. S. D. A.). (*Oklahoma Sta. Bien. Rpt.* 1941-42, pt. 1, pp. 54-61, figs. 6).—A progress report (E. S. R., 84, p. 781) noting safer methods for fumigating wheat bins, timing in relation to armyworm control in wheat, covering stubble for control of the brown wheat mite *Tetranychus tritici*, pest survey and insect control, location of apiaries, garden insect control, carriers of anaplasmosis, flatheaded apple tree borer control, phosphorus in relation to chinch bug damage on sorghums, testing barleys for chinch bug resistance, and cotton in relation to melon aphid abundance in cantaloup fields.

Insetos do Brasil [Insects of Brazil], A. DA COSTA LIMA (*Rio de Janeiro: Escola Nac. Agron.*, 1942, vol. 3, pp. 327, figs. 267).—This third volume (E. S. R., 85, p. 85) takes up the nine superfamilies of the order Homoptera, a bibliography accompanying each.

The measurement of the effect of entomophagous insects on population densities of their hosts, H. S. SMITH and P. DE BACH. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 845-849, figs. 3).—The need of methods for measuring the quantitative effect of introduced entomophagous insects on the survival of their host populations is considered. The difficulty of excluding the introduced enemies from test plats appears to be one of the principal obstacles. Report is made of an experiment in which this was accomplished by the use of sleeves of fine-meshed cloth in such a way that the effect of the presence and absence of parasites on the survival of their host populations could be measured.

Controlling insects in the home vegetable garden, B. B. PEPPER (*New Jersey Stas. Cir.* 445 (1942), pp. 17).—A practical account.

Recommendations for control of tomato insects, W. W. STANLEY and S. MARCOVITCH (*Tennessee Sta. Cir.* 82 (1943), pp. [2]).

Orchard insects of the Pacific Northwest and their control, E. J. NEWCOMB (*U. S. Dept. Agr. Cir.* 270, rev. (1942), pp. 80, figs. 83).—A revision (*E. S. R.*, 70, p. 358).

The control of insects infesting dried fruits, W. BURNS BROWN and A. E. H. HIGGINS (*London: Dept. Sci. and Indus. Res.*, 1942, pp. [3]+I+23, figs. 8).

Insect survival in drying grain, M. D. FARRAR and R. H. REED. (Ill. Nat. Hist. Survey and Univ. Ill.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 923-928 fig. 1).—A determination was made of lethal drying conditions for seven species of insects in their natural breeding medium, namely, angoumois grain moth and rice and granary weevils in ear corn and the lesser grain borer, confused flour beetle, flat grain beetle, saw-toothed grain beetle, and rice and granary weevils in wheat. Higher temperatures were found to be more destructive to all insects than lower temperatures, as were higher humidities and longer drying periods. "The rice and granary weevils were killed at lower temperatures, lower humidities, and shorter times of exposure than were the other species. The confused flour beetle and flat grain beetle adults were more resistant to drying than the rice or granary weevil and less resistant than the saw-toothed grain beetle. The adult saw-toothed grain beetle was less resistant than the angoumois grain moth, which in turn was less resistant than the adult lesser grain borer. Insects were more easily killed in ear corn than in shelled corn, wheat, or barley because the large air spaces permitted rapid movement of the air. The tendency for air to seek channels through a mass of grain or ear corn may result in differences of as much as 50° in the temperature within a distance of 2 to 4 in. The commercial drying of hybrid seed corn at dry bulb temperatures of 105° to 110° and wet bulb temperatures of 70° to 80° would not kill the common insects that infest stored grain."

Insects infesting house plants.—II, Insects and allies of insects infesting the soil, E. I. McDANIEL (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 2, pp. 242-245, figs. 3).—A continuation of this account (*E. S. R.*, 88, p. 656.)

[Contributions on shade tree insects] (*Natl. Shade Tree Conf. Proc.*, 17 (1941), pp. 108-118, figs. 4).—Among the contributions here presented are: The Outstanding Insects of Shade Trees in Maryland in 1941, by E. N. Cory (pp. 108-109) (Univ. Md.); and Control of the Pine Sawfly *Neodiprion sertifer* Geoff. With Concentrated Lead Arsenate Sprays, by C. C. Hamilton (pp. 110-116) (N. J. Expt. Stas.).

Isolation of *Ceratostomella ulmi* from insects attracted to felled elm trees, T. H. JONES and C. S. MOSES. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 66 (1943), No. 2, pp. 77-85, figs. 2).—Experiments were conducted from 1936 to 1939 to ascertain what species of insects carried the Dutch elm disease fungus (*C. ulmi*) and what percentage of each species was contaminated with the organism. Insects attracted to felled healthy American elms at several locations in New Jersey and New York were collected, identified, and cultured. *C. ulmi* was found most frequently in two species of elm bark beetles which are the most important insect carriers of the disease organism, namely, the smaller European elm bark beetle and the native elm bark beetle. This organism was isolated in a few cases from four other beetles, namely, *Xylobiops basilaris* (Say), *Conotrachelus knaglypticus* (Say), *Xylosandrus germanus* Bldfd., and the red elm bark weevil. *C. ulmi* was isolated from 6.9, 5.8, 7.7, and 5.7 percent of the smaller European elm bark beetles and from 4.3, 2.4, 3.3, and 0.7 percent of the native elm bark

beetles cultured in 1936, 1937, 1938, and 1939, respectively. The percentage of these two elm bark beetles contaminated with *C. ulmi* varied considerably at different locations in the same year and at the same location in different years.

Current contributions on insect control, II (*New York State Sta. Bul.* 703 (1943), pp. 64, figs. 9).—Included in this second series (E. S. R., 86, p. 651) are the following: The Control of the Common Red Spider [*Tetranychus bimaculatus* (Harvey)] on Lima Beans, by H. C. Hockett (pp. 5-7); Observations on the Economic Importance and Control of the European Chafer [*Amphimallon majalis* Razoum], by F. L. Gambrell (pp. 8-13); Rotenone for Apple Maggot Control (pp. 13-14) and Tank-Mixed Oil Sprays for European Red Mite Control (pp. 51-55), both by R. W. Dean; Experiments With Milky Disease for the Natural Control of the Japanese Beetle (pp. 14-17) and Insecticides for Peachtree Borer Control (pp. 62-63), both by E. H. Wheeler; An Improvement in the Nonresidue Apple Spray Schedule (pp. 17-18), Spreaders for Codling Moth Sprays on Apple (pp. 36-38), and The Effect of Summer Sprays on San Jose Scale Control on Apple (pp. 63-64), all by S. W. Harman; Substitutes for Mercury Salts in Cabbage Maggot Control, by H. Glasgow (pp. 18-20); A New Apple Leafroller [*Pseudeucoena mali*], by P. J. Chapman and D. E. Greenwood (pp. 20-22); Tests of Modified Mixtures for the Control of [Eye-Spotted] Bud Moth on Apple (pp. 23-26), and New Phases of Rosy Apple Aphid Control (pp. 26-30), both by F. Z. Hartzell; Summer Oil-Nicotine Sprays for Oriental Fruit Moth Control on Quinces, by S. C. Mendall and A. W. Avens (pp. 30-33); An Alternative Insecticide for European Corn Borer Control, by L. A. Carruth (pp. 33-36); A Study of Rotenone-Bearing Dusts for Cabbage Insect Control, by G. E. R. Hervey (pp. 39-44); Diluents and Supplements for Lead Arsenate Dusts for Cabbage Worm Control, by G. E. R. Hervey and G. W. Pearce (pp. 44-46); Experiments With Dinitro Insecticides and Oil Sprays for the Control of Pear Psylla, by F. G. Mundinger (pp. 46-48); A Shortened, Intensive Summer Spray Program for Apples in Eastern New York—Second Report, by J. L. Brann, Jr., and D. W. Hamilton (pp. 48-51) (coop. U. S. D. A.) (E. S. R. 86, p. 652); Studies of Spray Supplements for Grape Berry Moth Control, by E. F. Taschenberg (pp. 55-57); Influence of Temperature and Rainfall on the Performance of Oil Sprays, by P. J. Chapman, G. W. Pearce, and A. W. Avens (pp. 57-59); and Notes on the Cherry Leaf-miner [*Profenusa canadensis* Marlatt], by D. W. Hamilton (pp. 59-61) (coop. U. S. D. A.).

"Natural" control of insects (*Farm Res.* [New York State Sta.], 9 (1943), No. 1, p. 19).—A practical account.

Fluorine compounds useful in the control of insects, S. MARCOVITCH and W. W. STANLEY (*Tennessee Sta. Bul.* 182 (1942), pp. 46, figs. 25).—A review of the experimental work since 1924 with fluorine compounds, especially sodium fluoride, sodium fluosilicate, and cryolite. Sodium fluoride is valuable for the control of cockroaches, chicken lice, silverfish, and ants. Sodium fluosilicate is useful as a mothproofing agent and for the control of grasshoppers, crickets, cutworms, and certain weevils. The author states that "the virtues of cryolite as an insecticide lie in the fact that it will not injure foliage nor result in soil poisoning. In its effect on insects, cryolite is in the same zone of toxicity as lead arsenate. For certain insects, cryolite is specific and more toxic than magnesium arsenate or calcium arsenate." A large quantity of cryolite is used annually for codling moth control in the Pacific Northwest. Cryolite is also used for control of orange worms, the walnut husk fly, Mexican bean beetle, tomato fruitworm, flea beetles, cabbageworms, cranberry insects, blister beetles, and cucumber beetles. The relative toxicities of these three compounds to lower and higher animals are discussed.

Relative effectiveness of several rotenone-containing insecticides against various insects, F. S. ARANT. (Ala. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 873-878).—Report is made of laboratory and field tests of commercial samples of derris, timbo, and cube and samples of powdered *Tephrosia* roots against several species of insects. Derris and *Tephrosia* were more effective than *Lonchocarpus* of the same guaranteed rotenone content applied against a number of important vegetable pests.

Deposits of insecticidal dusts and diluents on charged plates, G. F. MACLEOD and L. M. SMITH. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 66 (1943), No. 2, pp. 87-95, figs. 4).—Deposits of materials on positively and negatively charged plates were measured. Powders of plant origin in general gave heavy deposits on the negatively charged plate, while diatomites and clays gave heavy deposits on the positively charged plate. Other materials were variously distributed. The ratio of deposits was influenced by the material of which the outlet tube was constructed. Increasing the length of the outlet tubing increased the major deposit of any given material up to a maximum point beyond which no further increase or decrease was apparent. Adding 1 percent of one powder to another increased the major deposit in four out of eight cases. Deposits resulting from a mixture of two powders could not be predicted from a study of each of the component materials.

Season nears end for the application of winter sprays, C. LYLE (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 1, p. 8).—A practical account.

Reduced spray concentrations for aphid and bud moth, F. Z. HARTZELL (*Farm Res. [New York State Sta.]*, 9 (1943), No. 1, pp. 11, 15).—A practical account as to possible economies.

Cumulative index to service and regulatory announcements, Nos. 1 to 149, inclusive (1914-41), Bureau of Entomology and Plant Quarantine, M. A. THOMPSON (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1942, pp. II+89).

Effects of infra-red irradiation on the American cockroach, G. F. MACLEOD. (Univ. Calif.). (*Pests*, 10 (1942), No. 7, pp. 22-23).—Using an incandescent lamp capable of producing and focusing a large amount of infrared radiation, adults of the American cockroach were killed by exposure of the ventral surface to radiation from this lamp at a distance of 18 in. for a period of 2.5 to 4 min. Twice this dosage was required to kill adults when treated on the dorsum. None of the cockroaches was killed when irradiated through a water screen which removed a large part of the infrared rays. All attempts to kill insects on plants have resulted thus far in injury or death of the plants before the insects were killed.

The activating effect of pyrethrum upon the German cockroach, J. M. HUTZEL. (Ohio State Univ. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 929-933, figs. 4).—A description is given of four methods employed to record the initial effect of pyrethrum on the German cockroach. The results indicate that pyrethrum is unique in its activating effect upon this insect. No other insecticide tested, including those containing N-butyl carbitol thiocyanate, rotenone, or nicotine, caused similar violent reactions. The activating effect of pyrethrum is of practical value because sublethal doses will impel the roaches to desert their hiding places and become exposed to lethal doses. In applications of pyrethrum dusts the reaction is such that the roaches drag their abdomens and otherwise increase the amount of toxicant adhering to their bodies.

Action of pyrethrum upon the German cockroach, J. M. HUTZEL. (Ohio State Univ. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 933-937, fig. 1).—This further contribution (see above) presents the results of an investigation

of the factors influencing the appendicular reactions (excitation, convulsions, and paralysis) of pyrethrum-treated German cockroaches by means of kymograph recordings. The results strongly suggest that excitation and paralysis of the German cockroach depend upon the rate of diffusion of the pyrethrins through integumentary secretions as influenced by the dose, concentration, and viscosity of the solution of the insecticide. The ventral surface of the cockroach is covered by an oily film which is present in sufficient quantity to moisten particles of pyrethrum powder applied to that area. In this manner the pyrethrins are enabled to diffuse from the particles and affect the insect. Pyrethrum affects the nervous system, since its activating effect upon the legs could be blocked by severing the nerve cord between the thorax and the point of application on the abdomen. This evidence is in accord with that of other investigators who were able to demonstrate cellular degeneration in the ganglia and connectives of pyrethrum-treated insects. The initial excitatory effect of pyrethrum upon the German cockroach appears to be the result of the stimulation of successive sensory endings in the integument. The time of onset of final paralysis appears to depend upon the speed with which the pyrethrins are spread to the thorax and their subsequent inactivation of the thoracic ganglia.

An international termite exposure test—[eleventh, twelfth, and thirteenth progress reports], G. M. HUNT and T. E. SNYDER. (U. S. D. A. coop. Univ. Wis.). (*Amer. Wood-Preservers' Assoc. Proc.*, 36 (1940), pp. 378-392; 37 (1941), pp. 379-392; 38 (1942), pp. 450-462).—These reports (E. S. R., 82, p. 219) record the results obtained from wood specimens treated with various chemicals and exposed to the activities of termites and decay.

Effect of the addition of sulfonated oil on the toxicity of cube and derris to plant bugs, R. A. FULTON and N. F. HOWARD. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 867-870, fig. 1).—Laboratory tests with the harlequin bug and the squash bug in which certain natural and sulfonated vegetable oils were used in combination with derris or cube indicate that the sulfonated oils are equal or superior to their natural counterparts in toxicity to these insects. In tests with the harlequin bug each oil used increased the toxicity of derris very significantly. Sulfonated olive and soybean oils appeared outstanding. In tests with the squash bug the addition of acetone to natural or sulfonated oil-cube sprays significantly increased their toxicity. Without acetone, sulfonated peanut oil-cube spray was superior to cube sprays containing sulfonated soybean or grapefruit seed oils. Injury to cucurbits and crucifers may result from the application of oil, but sulfonated oils are less injurious than emulsified natural oils.

Insecticidal tests for field control of *Lygus* bugs in seed alfalfa, C. J. SOREXSON. (Utah Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 884-886).—Experiments conducted in 1933 and from 1937 to 1941 with insecticides have shown that other methods than the use of insecticides will have to be employed or developed for the current prevention and control of *Lygus* bugs in alfalfa-seed fields.

Etude sur la biologie de *Dysdercus supersticiosus* F. (Hemiptera) [A study of the biology of *Dysdercus supersticiosus* F. (Hemiptera)], J. M. VREYDAGE (*Inst. Natl. Etude Agron. Congo Belge Pubs., Sér. Sci.*, No. 24 (1941), pp. 19, figs. 3).

The use of cyanide in controlling the root form of the woolly apple aphid, C. F. SMITH. (N. C. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 908-910).—The results of tests made on the control of the woolly apple aphid and tree tolerance to sodium cyanide, carbon disulfide, and dichloroethyl

ether in 1940 and 1941 and the injury caused to aphid-free apple seedlings treated with these chemicals are summarized in tables. Injury occurred when more than 1 gm. of sodium cyanide was used per tree or in less than a quart of water. Also, good control was obtained with as little as 0.5 gm. of cyanide per tree in a pint of water in 1940 and 1941, and 0.1 gm. gave good control in 1940. In using cyanide it is believed the quantity of water and cyanide needed will depend on the moisture content of the soil and the degree of infestation, less water and cyanide being needed in moist situations where the infestation is light and more water and cyanide in the dry situations where the infestation extends over all the roots. Enough water and cyanide should be used to carry the cyanide to the lowest aphids on the roots. The results indicate that sodium cyanide will not injure young healthy apple seedlings unless more than 1 gm. is used per tree. Carbon disulfide in water is fairly safe at the concentrations used, but it does not give satisfactory control. Young apple seedlings seem quite susceptible to dichloroethyl ether at the concentrations used. Many more of the root hairs were injured in cases marked "slight injury" than was the case with carbon disulfide or sodium cyanide. Mention is also made of several materials tested that proved unsatisfactory.

New materials for control of the mealy plum aphid, L. M. SMITH and C. A. FERREIS (*California Sta. Bul. 671 (1942), pp. 30, figs. 2*).—Dinitro-*o*-cyclohexylphenol and sodium dinitro-*o*-cresolate were studied extensively, and both showed promise as winter sprays for the destruction of mealy plum aphid eggs and some scale insects in certain combinations. Neither compound, however, was effective against the Italian pear scale, and both injured cover crops. Trees were not damaged by dormant applications, but severe injury resulted if these materials were applied to trees which were starting to bloom. In special cases early-fall applications of dinitro phenols and cresols, without oil, showed interesting possibilities.

A physiological difference in the two races of red scale and its relation to tolerance to HCN, H. J. QUAYLE. (*Calif. Citrus Expt. Sta.*). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 813-816, figs. 2).—In this further contribution (E. S. R., 79, p. 656) reference is first made to the finding of Hardman and Craig (E. S. R., 86, p. 218) that in the time of closure of the spiracles there is an observable physiological basis for differentiating the resistant and nonresistant scales. However, the facts that the differential in tolerance is noted in a fumigation exposure of 2.5 min. (before there is any closure in either strain), as well as at other exposures up to and including 2 hr., that it occurs independently of stupefaction or differences in temperature, and that there is the possibility of the spiracles not functioning as claimed during at least a part of the molting process do not appear to support the longer period of closure of the spiracles in one strain as accounting for such differential.

Reaction of resistant and nonresistant strains of California red scale to fumigation with HCN, H. R. YUST, R. L. BUSHEY, and H. D. NELSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 816-820).—Report is made of a study of the effect of pretreatment, treatment, and posttreatment temperatures and prefumigation with sublethal dosages on the susceptibility of resistant and nonresistant strains of the California red scale to fumigation with hydrocyanic acid. "When scales were preconditioned and postconditioned for 4 hr. at the treatment temperatures, the kill of the resistant scales in the second molt and in the mature female scale and of the nonresistant scales in the second molt was increased by lowering the temperatures, but the kill of nonresistant mature female scales was not influenced by the treatment temperature. When mature female scales were preconditioned for 18 hr. instead of 4 hr., the kill of the

resistant scales was increased by lowering the temperatures, and the kill of the nonresistant scales was decreased. In fumigations of scales in the second molt at both 59° and 77° F. preconditioning at 59° increased the kill of both strains, but the effect of the pretreatment temperature was produced more quickly in the nonresistant strain than in the resistant strain. In fumigations of mature female scales at 59° short preconditioning periods of 2 or 4 hr. significantly increased the kill of resistant scales but did not influence the kill of nonresistant scales. The kill of resistant scales was influenced more by the temperature after fumigation than was the kill of nonresistant scales. In the second molt the kills of both strains were decreased by prefumigation with sublethal dosages, but the differences were more marked with the resistant strain. In the mature female stage the kill of resistant scales was decreased significantly by prefumigation in treatments at 59°. The kill of the nonresistant scales was not changed by prefumigation 1 hr. before the final fumigation when the preconditioning period was 4 hr., but when the preconditioning period was 18 hr. the kill was significantly increased by prefumigation."

Factors influencing results of laboratory fumigation of California red scale with HCN. H. R. YUST and L. B. HOWARD. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 821-824).—Report is made of laboratory fumigation work conducted to determine the cause of variations that have resulted in the use of hydrocyanic acid gas against the California red scale. "The scales were reared on lemon fruits in the laboratory and fumigated at 77° F. and 65 percent relative humidity. Better kills were obtained on lemons that were slightly soft than on those that were firm and turgid. At times the kill on fruits from different groves was markedly different, although the appearance of the fruits was the same. On the same fruits mature female scales that were fused together were a little more difficult to kill than those that were not touching other insects. Frequently, difference in age within the stage affected the kill, probably owing to a difference in degree of development. An increase of 18° in the temperature after fumigation favored increased mortality of scales in the second molt and of mature females, but the two stages reacted differently to a drop of 25° after fumigation. The scales in the second molt developed more slowly after a high kill than after a low kill; therefore the total mortality could not be determined so quickly after a high kill."

Spray-fumigation experiments on California red scale. D. L. LINDGREN and R. C. DICKSON. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 827-829).—In laboratory tests in which the California red scale was treated with oil spray and with hydrocyanic acid gas fumigation, used separately and in combination, scales which survived the oil spray treatment did not prove to be more susceptible to fumigation than unsprayed scales. The length of the interval between the spray treatment and the fumigation treatment does not seem to be an important factor. The second-molt and early-gray stages of red scale, which are the most likely to survive the fumigation, are relatively easy to kill by the oil spray. The late-gray and adult insects, which are difficult to kill by oil spray, are comparatively easy to kill by fumigation. From the results of the experiments it appears that the satisfactory control of California red scale by the use of a combination of oil-spray and fumigation treatments is due to the additive effect of the two treatments and to the complementary nature of the kills resulting from the separate treatments. The order in which the treatments are given has no significant effect on the combined results, but the factors of climate and tree tolerance indicate that, in the field, the spray should usually precede the fumigation.

Fumigation of yellow scale with HCN under laboratory conditions. H. R. YUST, H. D. NELSON, and R. L. BUSBEY. (U. S. D. A.). (*Jour. Econ. Ent.*, 35

(1942), No. 6, pp. 825-826).—It was found in hydrocyanic acid fumigation with the yellow scale, reared in the laboratory on lemon fruits under controlled conditions, that female scales were considerably less susceptible to fumigation than those in the second molt. Under similar conditions California red scales in the second-molt stage were more difficult to kill than the mature females. In the second-molt stage yellow scales and California red scales of the nonresistant strain were about equally susceptible to hydrocyanic acid, but in the mature stage yellow scales and California red scales of the resistant strain were equally susceptible. As with the California red scale, the mortality of yellow scales decreased as the temperature at the time of fumigation was increased. Prefumigation with sublethal dosages of hydrocyanic acid caused in practically all cases a considerable lowering of the mortality of the yellow scale in both the mature female and second-molt stages exposed immediately thereafter to a lethal concentration. Yellow scales from stocks obtained in southern California were more difficult to kill than those from stocks obtained in central California.

Biological observations on the citricola scale and its parasites, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 830-833).—A study of the host plants and parasites of the citricola scale in California has shown this serious pest of citrus in the more arid regions of the State to be better adapted to hackberry (*Celtis* spp.) than to citrus. It has been found on hackberry only in or near areas of infested citrus. Citricola scale is known to occur outside of California only in Japan, where it is not a pest of consequence. Hackberry occurring in Japan, China, and Australia appears to be free from citricola scale. In Japan citricola scale is parasitized by *Metaphycus orientalis* Comp., *Coccophagus yoshidae* Nakayama, *C. japonicus* Comp., *C. hawaiiensis* Timb., and *Anicetus annulatus* Timb. In California it is attacked by *M. luteolus* Comp., *M. stanleyi* Comp., *M. helvolus* Comp., *C. lycimnia* (Walk.), and *C. scutellaris* (Dal.).

Life history and habits of the potato flea beetle in western Nebraska, R. E. HILL and H. D. TATE. (Nebr. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6 pp. 879-884, figs. 4).—In work in the potato-growing section of western Nebraska it was shown that a relatively high percentage of adult potato flea beetles were able to survive the winter of 1940-41 in soil covered with debris or crop residue such as potato vines. The survival ranged from 34.5 percent in soil covered with potato vines to 8.3 in alfalfa stubble. Two complete generations of the potato flea beetle developed during the season in the insectary. On the basis of the life history data presented it is evident that the larvae of the first generation develop largely in early-planted potatoes and the second generation principally in the late plantings. This has led to the conclusion that elimination of the early potato crop, including those plantings up to about June 10 (at present a relatively small proportion of the total acreage in western Nebraska), would materially reduce the likelihood of serious potato flea beetle injury in the area.

Dichloroethyl ether for control of the sugar-beet wireworm, M. W. STONE. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 860-866).—The findings of Campbell and Stone (*E. S. R.*, 77, p. 65) and of Pepper (*E. S. R.*, 83, p. 377) led to the further investigation of dichloroethyl ether as a soil insecticide for the sugar beet wireworm. In the work here reported upon, conducted at Downey, Calif., in 1937, 1938, and 1939, the treatment of bait rows with concentrations of 0.2 to 1.2 oz. of dichloroethyl ether per 100 gal. of water at rates of 4 to 6 gal. of solution per foot of row resulted in wireworm mortalities of 81 to 100 percent. The addition of small quantities of emulsified dichloroethyl ether directly to tap water resulted in high mortalities of wireworms in cages

placed in trenches at different depths and distances from point of application. Similar results were obtained when potatoes and corn planted in furrows were treated with 3.4 and 5.1 oz. of dichloroethyl ether per 100 gal. of water at rates ranging from 1 to 3 gal. of solution per foot of row. There was no injury or retardation in the growth of these plants or of sugar beets and onions. The root systems of newly set tomato plants were affected by one application of 7- and 10-oz. concentrations of dichloroethyl ether per gallon of water, but after 2 mo. there was no difference in size between the treated root systems and those receiving water only. Wireworms were both repelled and killed by application of a mixture of fertilizer and sawdust treated with dichloroethyl ether to seed pieces at the time of planting. The wireworm population of small plats was reduced 21 to 65 percent by applications of weak concentrations of dichloroethyl ether in irrigation water carried to furrows or on the soil surface.

Laboratory propagation of two predators of the mountain pine beetle, G. R. STRUBLE. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 841-844, fig. 1).—In experiments with the green trogositid and the red-bellied clerid beetles (*Tennochila virscens* (F.) and *Enoclerus sphgeus* (F.)), thought to be important predators of the mountain pine beetle, it was shown that they may be reared under artificial conditions from egg to adult in the laboratory.

Fumigation of small land areas for control of white-fringed beetles, E. M. LIVINGSTONE and G. R. SWANK. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 919-922, figs. 3).—Experiments conducted in the vicinities of Monroeville, Ala., and Gulfport, Miss., during the period 1939-41 have shown that dosages of 4.7 cc. of methyl bromide would give complete mortality of all stages of the insects at an exposure of 3.75 days when the soil temperature is between 62° and 89° F. and at an exposure of 6 days when the temperature is between 45° and 62°. The results of tests with carbon disulfide indicate that complete mortality may be expected with a 3- to 4-day exposure if the temperature ranges from 80° to 87° F. At lower temperatures none of the exposures tested consistently killed all the insects.

Biology of *Cylindrocopturus furnissi* Buchanan on Douglas-fir, R. L. FURNISS. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 853-859, fig. 1).—Report is made of a detailed study, largely from 1938 to 1941 and chiefly at La Graine, Wash., of *C. furnissi*, a minor weevil pest of naturally established Douglas fir reproduction in western Washington and Oregon and northwestern California.

Effectiveness of derris and cube in pickleworm control, F. S. ARANT. (Ala. Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 870-872).—In previous experiments (E. S. R., 84, p. 648; 86, p. 74) it was shown that derris-talc dusts containing 1 percent rotenone were effective in controlling the pickleworm under favorable conditions. In the present studies it was found that during a period of frequent rainfall 1 percent rotenone mixture of derris, talc, and flour did not give satisfactory control when applied to cantaloups at 10- and 15-day intervals; when applied at 5-day intervals the mixture gave 61-percent control. "This treatment was only two-thirds as effective as in previous years during more favorable weather conditions. Pickleworm infestation was extremely heavy in late cantaloups grown adjacent to plats of earlier melons. Derris and cube dusts containing 1 percent rotenone did not reduce the infestation materially until the dosage was increased to 20 lb. per acre per application. Twelve dustings at the average rate of 17.5 lb. per acre did not give practical control, although worm-free melons were matured at the rate of 750 to 2,080 per acre on the dusted plats as compared with none on the checks. Derris was more effective than cube. Cuproclide incorporated into one of the dust mixtures resulted in healthier

plants and higher yields than were obtained on plats not dusted with Cuprocide. Ten applications of 1 percent rotenone dust applied at 5-day intervals at the rate of 12.5 lb. per acre gave satisfactory control of the pickle in cucumbers during a period of favorable weather. Derris gave 93 percent control and cube 79 percent."

Time relationship of spring brood codling moth entry and subsequent worm entry, R. L. WEBSTER and W. J. O'NEILL (Iowa Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 806-809, figs. 2).—Bait trap records of moth catch during the years 1939, 1940, and 1941 in the Wenatchee Valley of Washington are reported upon. The shortest time interval between the peak of moth catch and that of worm entry was 9 days in 1940, when the mean maximum temperature for this period was 81.7° F. The longest time interval was 29 days in 1939, from the first high peak May 12 to the peak of worm entry June 10. The mean maximum temperature for this period was 75°. Two main peaks occurred in the moth catch in addition to minor peaks. The maximum time difference in days is figured from the earlier peak. Mineral oil at ovicidal concentrations probably was of little value in the second cover spray in 1939 and 1941, but of great value in 1940. Delayed until the third cover spray in 1940, mineral oil would have had little value as an ovicide since the third cover was not applied until some days after the peak of worm entry. On the other hand, oil in the third cover in 1939 and in 1941 would have served well as an ovicide, since these applications were made well before the peak of worm entry.

Spreaders in codling moth sprays, L. T. GRAHAM and C. H. RICHARDSON. (Iowa Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 911-914).—The findings reported have shown that under Iowa conditions the effectiveness of codling moth sprays is not improved by the addition of soybean flour or lime-casein spreaders. No advantage was detected from the use of a sodium oleyl sulfate-resin spreader-sticker, although the data suggest that some benefit might be gained from it. Modification of the physical properties of a lead arsenate spray may not be reflected in improved codling moth control. A list of 41 references to the literature cited is included.

Toxicity of nicotine compounds to newly hatched codling moth larvae, R. HANSBERRY. (Cornell Univ.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 915-918).—The results of tests of 31 compounds of nicotine against newly hatched codling moth, both with fresh and weathered deposits, are reported in table form. Water-soluble compounds, with the exception of nicotine sulfate, gave poor kills of larvae both before and after weathering. Most insoluble compounds gave high kills with fresh deposits, but the coarser crystalline materials lost much of their effectiveness during weathering. Fine powders which were water resistant lost comparatively less toxicity during weathering. Since these materials were used without supplements, many of them may be improved by fine grinding, controlled precipitation, or the use of supplements. Fixed nictines were always more toxic than soluble materials, indicating that nicotine compounds kill newly hatched larvae primarily by stomach poison action, since it has been shown previously that fixed compounds are not toxic as contact agents. The best material, nicotine cuprocyanide, permitted only 8-percent entries in fruit sprayed with 0.5 lb. to 100 gal. and artificially weathered with 1 in. of rain compared to 44-percent entries in fruit sprayed with 3 lb. lead arsenate per 100 gal. and weathered under the same conditions.

Survival, weight, and location of European corn borers feeding on resistant and susceptible field corn, L. H. PATCH. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 66 (1943), No. 1, pp. 7-19, figs. 3).—Different plantings within two seasons of two single-cross hybrids of field corn, borer-resistant Ill. Hy × R4

and borer-susceptible III. A \times Ind. TR, were made at Toledo, Ohio, and infested by hand at different stages of plant development with equal numbers of egg masses of the European corn borer. The number of mature borers per plant on plants on which the borers hatched within 14 days of pollen shedding showed a pronounced increase over the number on plants in an earlier stage of development. In 1936 the number of mature borers in Hy \times R4 as a percentage of the number in A \times TR increased from 38 to 48 percent as the time between borer hatching and pollen shedding decreased from 38 to 14 days and then increased sharply to 86 as the interval decreased to 2 days. Within about 14 days of pollen shedding the relative availability of the tassel buds for feeding accounted for some of the difference in borer population between the two hybrids. In 1937 in A \times TR, 51 percent of the borers 4 days old were in the tassels 14 to 17 days before the plants shed pollen as compared with 5 percent in Hy \times R4, whose eclosion of tassels was delayed. Most of the differentiation in the borer population between the two hybrids occurred before the borers were 4 days old. From 18 to 46 days after hatching the borers in Hy \times R4 weighed 66 percent as much as those in A \times TR in the early plantings in 1937 and 81 percent as much in the late plantings. When 57 days old the borers in Hy \times R4 weighed more than 90 percent as much as the borers in A \times TR. The character of the feeding areas on the leaves and the excrement of the larvae also indicated that borer-resistant Hy \times R4 is a less suitable food for the borers. The relative locations of the borers in the two hybrids are given for different ages of the borers and the plants.

Goniozus indicus Ash., a natural enemy of the sugarcane white moth borer *Scirpophaga rhodoproctalis*, M. C. CHERIAN and P. ISRAEL (*Jour. Bombay Nat. Hist. Soc.*, 43 (1942), No. 3, pp. 488-493).—The biology of a bethylid parasite (*G. indicus*) of *S. rhodoproctalis* is reported upon.

Hibernation of the corn earworm in the central and northeastern parts of the United States, R. A. BLANCHARD. (Coop. expt. stas.). (*U. S. Dept. Agr., Tech. Bul.* 838 (1942), pp. 14, fig. 1).—Corn earworm larvae that mature after the middle of October are unable to enter hibernation in the Central and Northern States. The period from the middle of September to early in October is apparently the optimum time for larvae to enter the soil and hibernate successfully. Moth emergence extended from the second week in May to the last week in June, which is approximately the same time as under field conditions. Lack of survival at many of the points of observation might be due to length of exposure. Some mortality in hibernating forms was caused by diseases, earthworms, ants, nematodes, carabid beetle larvae, moles, rodents, and growing plant roots. Factors affecting hibernation indirectly were time of planting, rate of maturity of the corn, and time of the first frost in the fall. Cultural methods for destruction of hibernating earworms are recommended only for abandoned cornfields. Migrations from the South are suggested as the source of infestations found in the northern parts of the United States.

The biology of *Theobaldia inornata* Williston in captive colony, W. B. OWEN. (Univ. Wyo.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 903-907).—The author has found that the mosquito *T. inornata* can be easily established as a laboratory colony and appears to be well adapted for captive rearing. Although the larvae may be cultured by feeding them Pabulum, Purina Dog Chow, and other proprietary products, the most satisfactory method of rearing is in a semi-balanced aquarium supporting their natural food. At a temperature range of between 60° and 70° F. a new generation can be obtained in about 30 days. Blood feeding is necessary for normal egg laying. The average number of eggs produced by 14 vigorous females was 700.79. Approximately 98 percent of the eggs

laid by captive females were fertile. The average length of adult life for vigorous females was 95.79 days.

A method of estimating reduction in yield of wheat caused by hessian fly infestation. C. C. HILL, E. J. UHNE, and J. S. PINCKNEY (*U. S. Dept. Agr. Cir. 663 (1943), pp. 10, figs. 2*).—From a series of observations a table has been devised as an aid in determining the losses in yield of wheat due to different degrees of infestation by the spring generation of the hessian fly. Intermediate steps required investigations as to the relationship between the percentage of wheat culms infested and the number of purpuraria per culm and also the approximate number of productive wheat culms to be found per acre. The results of experiments conducted under controlled conditions were included to substantiate and supplement the original observations. These showed that the hessian fly causes considerably more loss than that due solely to the lessened development of the grain, some of this loss including a stunting of the wheat culm to the point of nonproductivity.

Factors predisposing animals to screwworm infestation in Texas. H. E. PARISH. (*U. S. D. A.*). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 899-903).—Forty-three factors predisposing animals to screwworm infestation in eight classes of livestock were found in work conducted during the screwworm seasons of 1936, 1938, 1939, and part of 1940 in connection with a study of the larvicidal and protective action of various materials in Menard and Kimble Counties, Tex. The most frequently infested man-made wounds were shear cuts, which were responsible for 48 percent of the infestations in goats and 73 percent in kids. Of the eight types of wounds that may be eliminated, those from birth are by far the most important, making possible about 63 percent of the screwworm infestations in calves and 8 percent in cattle. Of the six types of wounds that may be eliminated in part, the most outstanding was that from needle grass, which was responsible for about 35 percent of the screwworm infestation in the lambs and about 27 percent in sheep. Four wound types that require the aid of research veterinarians are listed. Pink eye was the most important, it being responsible for about 18 percent of the screwworm attacks on lambs and about 6 percent on sheep. Eighteen types of wounds are listed that cannot be extensively controlled at the present time, but the screwworm flies that might infest these wounds can be reduced in numbers.

Infestation of mature green papayas by the Mediterranean fruitfly. C. B. KECK. (*U. S. D. A.*). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 802-805, figs. 2).—Records of the catch of Mediterranean fruitflies in a papaya grove in Hawaii trapped for a period of more than a year have shown that the population is never very high in a well-kept grove. A catch of 47 flies during a week in an avocado tree on the border of the papaya grove as compared with 15 flies in four traps for a month indicates that the papaya tree is not a suitable place for flies to congregate, possibly because of the lack of dense foliage. Of 23 samples of mature but unripe papayas picked from the trees, 6 were infested. It is suggested that papaya trees be planted at least 12 ft. apart so as to reduce the density of foliage where trees might overlap. It appears from observations made that keeping the grove free of ripening fruits prevents the fly population from building up and also forces flies drifting in to oviposit in the less mature fruits. The data indicate that the shipment of untreated mature green papayas to the mainland would result in the transportation also of the immature stages of the Mediterranean fruitfly.

A laboratory method for evaluating feeding preference of fruitflies. R. H. MARLOWE. (*U. S. D. A.*). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 799-802).—Description is given of a laboratory technic and a method of analyzing the data

statistically. Both the Mediterranean fruitfly and the melon fly prefer invert sugar sirup, white corn sirup, levulose, dextrose, and sucrose to a solution of Hawaiian cane molasses. The addition of acid lead arsenate or tartar emetic to the molasses spray did not affect feeding. The two insecticides were comparable in respect to feeding preference. Melon flies preferred a 5-percent cane molasses solution containing sucrose to the same spray without the sugar. An increase in the sucrose concentration from 1 to 12.5 lb. caused a corresponding increase in feeding preference. From 12.5 to 25 lb. there was very little increase in preference.

Studies on the toxicity of tartar emetic to the Mexican fruit fly (*Anastrepha ludens* Loew) and the effects of applications of tartar emetic on citrus trees, C. C. PLUMMER (*Ohio State Univ., Abs. Doctoral Diss., No. 35* (1941), pp. 117-122, fig. 1).

Nectar and pollen plants of Oregon, H. A. SCULLEN and G. H. VANSSELL (Coop. U. S. D. A. et al.). (*Oregon Sta. Bul.* 412 (1942), pp. 63, figs. 34).—This publication contains a discussion of nectar and pollen and their sources, the floral areas of Oregon, plants that might injure bees, and methods for collecting and shipping honey plants for determination. Some 25 figures serve to illustrate some of the honey plants and their distribution in Oregon.

Susceptibility of honeybee larvae to individual inoculations with spores of *Bacillus* larvae, A. W. WOODROW. (U. S. D. A. coop. Ark., Iowa, Tex., Wis., and Wyo. Expt. Stas.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 892-895).—The author has found no evidence of larval resistance to American foulbrood although it is recognized that colonies through the behavior of adult bees do show distinct differences in resistance. A single spore apparently was sufficient to cause infection, although inoculations with large numbers of spores caused disease in a larger percentage of the larvae than did smaller numbers.

Effects of certain biological factors on the longevity of caged bees, L. M. BERTHOLF. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 887-891, fig. 1).—Observations of 23 lots of bees, each consisting of from 25 to 103 individuals taken from the flight board of a hive, age unknown, showed average longevities in captivity ranging from 9.13 ± 0.580 days to 22.90 ± 1.065 days, with a mean longevity of 16.24 ± 0.209 days for the entire group. Bees taken in winter showed a small but statistically significant increase in longevity over those taken in summer, while the longevity of those taken in spring and autumn fell about halfway between. Tests on the longevity in captivity of 17 lots of bees of known age ranging from 0.5 to 80 days at the time of capture showed no clear-cut decrease in longevity until an age of more than 30 days was reached.

The life of Langstroth, F. NALLE (*Ithaca, N. Y.: Cornell Univ. Press, 1942, pp. 215, figs. [5]*).—This work of 12 chapters and an appendix is presented with a foreword and an introduction by E. F. Phillips.

Ants as predators of *Cochliomyia americana* C. & P., A. W. LINQUIST. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 850-852).—Report is made of a study conducted at Uvalde, Tex., of the predators of the larvae and pupae of the screwworm during the warm seasons of the year. Ants were found to be valuable predators of third-stage larvae of this pest in the bodies of animals that die from screwworm infestations. They are abundant and come to a carcass before other blowfly larvae become numerous. An emergence of 4.1 percent of screwworm flies was recorded from exposed carcasses, but where the carcasses were protected 93.1-percent emergence resulted. In 196 field tests under a great variety of conditions, in which from 5 to 200 larvae were dropped so as to simulate the larvae escaping from wounds, a total emergence of 19.8 percent of flies was recorded. Larvae kept in jars and protected from ants yielded

from 70 to 100 percent emergence. It appears that larvae dropping in small numbers from wounds have a better chance of survival than when ensconced in a carcass, probably because it seems that carrion is an attractive medium to many species of ants. In both cases a low emergence is evident, and it is concluded that ants constitute an important natural control of the screwworm. This is in full effect from March to December and probably continues during the rest of the year.

Abortive development in parasitic Hymenoptera induced by the food-plant of the insect host, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 834-835).—Reference is made to recent investigations which indicate that marked physiological differences may exist between individuals of a single host species if such individuals feed on different food plants.

A race of *Comperiella bifasciata* successfully parasitizes California red scale, H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 809-812).—The history of the introduction of the California red scale parasite *C. bifasciata* is briefly reviewed.

The experience with this parasite in California has emphasized the fact that (1) an accurate knowledge of the taxonomic relationships of the host insect is of great importance, even if it is necessary to resort to biological studies for their clarification, (2) recognition must be given to the possibility that the host plant may confer on the host insect a kind of immunity to parasitization, and (3) cognizance must be taken of the fact that there are host-limited races of insect parasites, and that, in any parasite-importation program, this must be given due consideration.

Parasites of the filbert worm, S. M. DOHANIAN. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 836-841).—A discussion of parasites reared during the study of the filbert worm at Eugene, Ore.

A second introduced rat mite becomes annoying to man, H. E. EWING. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 9 (1942), No. 2, pp. 74-75).—An introduced mite *Allodermanyssus sanguineus* (Hirst), first recorded from the United States in 1923, although it had been collected in the District of Columbia in 1909, is now reported from Arizona, Georgia, New York, and Pennsylvania.

A contribution to the biology of *Ornithodoros hermsi* Wheeler, Herms, and Meyer, C. M. WHEELER. (Univ. Calif.). (*Jour. Parasitol.*, 29 (1943), No. 1, pp. 33-41, figs. 2).—A study of the biology of *O. hermsi* in which use was made of a constant temperature and humidity cabinet has shown the development from egg to egg to cover a period of 4 mo. and 16 days, requiring five instars from egg to adult with many of the larvae passing through two instars. The longevity of laboratory-reared ticks, with occasional feedings, was noted to cover a period of over 6.5 yr. from date of hatching to date of death. Infective adult ticks of unknown age taken in nature were observed to live in the laboratory for over 1.5 yr. Female ticks were able to withstand starvation for over 4 yr. This species occurs in the western United States, with records of capture from California, Idaho, and Colorado at elevations above 5,000 ft. and from Oregon at elevations of 3,000 and 3,600 ft. It is apparently a parasite of small mammals, particularly of species of western chipmunks belonging to the genus *Eutamias*.

ANIMAL PRODUCTION

Animal production in the post-war world, J. HAMMOND (*Guernsey Breeders' Jour.*, 63 (1943), No. 1, pp. 22-23).—Needed efforts to increase production of dairy products, beef, mutton, lamb, and eggs after the war are reviewed.

Our 1943 meat supply program, G. A. BROWN (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 216-219).—Methods for increased production of meat animals based on better management practices and increased feeding are reviewed.

[Animal production, poultry, and pasture investigations with livestock in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 43 (1942), pp. 90-94, 94-96, 97-100).—The following papers were presented at the annual meeting of the Association of Southern Agricultural Workers in continuation in part of investigations previously noted (E. S. R., 86, p. 224): Hybrid Beef Cattle, by A. O. Rhoad (pp. 90-91) (U. S. D. A.); Experiments in Spring Lamb Production, by C. M. Kincaid (p. 92) (Va. Expt. Sta.); Types of Ewes for Spring Lamb Production, by R. C. Miller (pp. 92-93) (Univ. Ky.); Pasture Improvement, by R. H. Lush (pp. 93-94); Forest Grazing With Beef Cattle, by J. E. Foster (pp. 94-95) (N. C. Sta.); Grazing Tests With Napier Grass, by W. G. Kirk, R. E. Blaser, and R. M. Crown (p. 96) (Univ. Fla.); Methods of Feeding Soybeans to Hogs, by E. H. Hostetler (pp. 97-98) (Univ. N. C.); Maintenance and Growth Requirements in the Rations of Fattening Steers, by A. L. Shealy (pp. 98-99) (Fla. Sta.); and General Report of the Committee on Policy of the Animal Husbandry Group, by J. B. Francioni, Jr. (pp. 99-100) (La. State Univ.).

[Livestock and dairy investigations at the Arkansas Station] (*Arkansas Sta. Bul.* 428 (1942), pp. 23-29, 47-49).—Brief results are presented of studies on the use for feeder calves of silage from Johnson grass, dough-stage and mature Atlas sorgo, and hegari; skim milk, whey, and pasture for pigs, and manganese, copper, and iron not needed under average conditions, both by S. R. Johnson; effects of nicotine sulfate and kamala on egg production, by R. M. Smith; counts of mold mycelia for quality in cream and butter, by T. J. Claydon; replacement of proteins by soybean products in poultry rations; and prospects and feeds for broiler production.

[Investigations of livestock production at the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt.* 1941-42, pt. 1, pp. 26-33, 46-51, 51-53, 85-86, figs. 9).—Results are briefly presented on various grain concentrates and pasture for fat lamb production, molasses for fat lamb rations, ground Love grass hay for wethers, goats for clearing pastures, oats for fattening steers, urea in chick rations, feather picking prevented by fiber, breed variations in feed utilization by capons, laying tests for identifying production strains, satisfactory homemade electric brooders, and grazing and dry roughages for cattle.

Studies on the chemical composition of pods and seeds of certain species of *Medicago*, with a note on the apparent digestibility of cluster clover (*Trifolium glomeratum* L.) seed, M. C. FRANKLIN and R. F. POWNING (*Jour. Council Sci. and Indus. Res. [Austral.]*, 15 (1942), No. 3, pp. 191-200).—Study of seeds of different *Medicago* species showed that cluster clover seed was small and hard. Such seeds were held firmly within the hulls. Although there was considerable variability between species, the digestibility of the dry matter was increased 63 percent by grinding, and the digestibility of the crude protein was raised from 39.7 to 89.3 percent when fed with alfalfa chaff. Chemical analyses of samples of seeds from different species were presented.

A comparison of acetic acid, fed in the form of triacetin, with glucose as a nutrient in feeds, T. B. McMANUS, C. B. BENDER, and J. F. GARRETT. (N. J. Expt. Stas.). (*Jour. Dairy Sci.*, 26 (1943), No. 1, pp. 13-23, figs. 4).—A ration containing about 20 percent triacetin to supply acetic acid in the diet was palatable and had no harmful effect on rats. Rats which received 8.18 percent glycerol and 15 percent glucose in their diet made equal growth and showed equal efficiency in utilization of nutrients in 51 days. Growth of the rats was

not as good on a ration containing no glucose or triacetin, thus making the nutritive value of acetic acid evident. Heat production, respiratory quotients, and energy losses were ascertained with 3 lots of male and female rats comprising 48 animals.

Vitamin A and carotene requirements of livestock, F. B. MORRISON. (Cornell Univ.). (*Flour and Feed*, 43 (1943), No. 8, pp. 12-13).—A brief review of the vitamin A and carotene in yellow corn, hay, and silage, and the requirements of cattle, sheep, and swine for vitamin A.

Carotene content of Texas range forages, A. R. KEMMERER, J. F. FUDGE, and G. S. FRAPS. (Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 34 (1942), No. 9, pp. 851-855).—Analysis of fresh, dried, and dormant grasses for the carotene content of different species showed the green forages to vary from 495 p. p. m. in *Dallis grass* to 2 p. p. m. in *sotol bulb*. Dried and dormant forages ranged from 2 p. p. m. in *Bermuda grass* to 94 p. p. m. in *buffalo grass*. Practically all of the dried and dormant range grasses would supply enough carotene for the maintenance requirements of 1,500 μ g. per 100 lb. live weight in beef cattle, discussed by Hart and Gullbert (E. S. R., 70, p. 662), but not enough to produce high milk production, studied by Fraps et al. (E. S. R., 72, p. 244). The β -carotene of the dried forage ranged from 61 to 94 percent of the crude carotene, but in *sumac* and *kafir silage* it ranged from 58 to 64 percent.

Vitamin D content of shark liver oil, L. L. RUSOFF and N. R. MEHRHOF. (Fla. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 47-48).—Florida shark-liver oil, previously found to be a potent source of vitamin A (E. S. R., 82, p. 378), contained about 35 A. O. A. C. chick units of vitamin D per gram. The experiment was carried out with 6 lots of 24 day-old crossbred (Rhode Island Red δ \times Light Sussex η) chicks of both sexes. The bone ash averaged 31.09 percent for the controls and about 40 percent with 15 or 20 units of cod-liver oil or 0.50 percent of shark-liver oil. Pullets were consistently able to utilize vitamin D more efficiently than cockerels.

Inspection of commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir.* 273 (1942), pp. 27, fig. 1).—The usual summary (E. S. R., 86, p. 664) of 3,931 samples of commercial feeding stuffs inspected in 1941, including the inspection of 63 samples of vitamin D supplements.

Inspection of commercial feedstuffs, P. H. SMITH (*Massachusetts Sta. Control Ser. Bul.* 113 (1942), pp. 25).—In the official inspection (E. S. R., 86, p. 817) of 1,518 samples of feeding stuffs in 1941, none sufficiently departed from guarantees to warrant prosecution. Data are included on the carotene content of alfalfa meals, manganese content of commercial mashes, the riboflavin of various products, protein quality of fish and meat meals, and the quality of ground oats found on Massachusetts markets.

Beef calf production in Mississippi, R. H. MEANS, A. E. CULLISON, E. B. FERRIS, and S. P. CROCKETT (*Mississippi Sta. Bul.* 371 (1942), pp. 25, figs. 7).—The results of pasture and breeding 340 native south Mississippi cows to registered Hereford and Aberdeen Angus bulls at State College, at the Natchez and Holly Spring Branch Stations, and in several land-use research areas, showed generally favorable results from the practices. Although the soil types of the pastures were decidedly different, the practices in producing and marketing the calves were generally satisfactory.

The importance of body weight in selection of range ewes, C. E. TERBIL and J. A. STOEHR. (U. S. D. A.). (*Jour. Anim. Sci.*, 1 (1942), No. 3, pp. 221-228).—The word "inversely" in line 8 of the abstract previously noted (E. S. R., 88, p. 233) should be deleted and the sentence followed by this addition: "There was an inverse relationship between average lifetime body weight and pounds

of lamb weaned per ewe year when considered independently of fall yearling weight."

"Density" and some related characters of the fleece in the Australian Merino, H. B. CARTER (*Jour. Council Sci. and Indus. Res. [Austral.]*, 15 (1942), No. 3, pp. 217-220).—Among South African and Australian Merinos there was found great variation in the density of the skin fiber population. Both the fleece yield and fleece quality enter into the density of the fibers. The examination of many samples of Australian Merino fleeces lends support to the suggestion that the Australian Merino is the product of cross-breeding in which there entered the Leicester, Lincoln, Cotswold, Romney Marsh, and, to a slight extent, the Southdown, with some unknown Asiatic breeds.

Feeding methods and rations for fattening lambs, P. S. JORDAN and W. H. PETERS (*Minnesota Sta. Bul.* 306, rev. (1942), pp. 16).—In continuation of previous investigations of feeding methods and rations for fattening lambs at Morris, Minn. (E. S. R., 71, p. 823), comparative results were reported for 30 lots of 30 lambs each hand-fed or self-fed on rations containing whole or ground corn or oats fed in different proportions with whole and cut alfalfa hay, with and without different percentages of linseed meal during fattening periods of 65-87 days' duration in 1938-42. Hand-feeding grains proved slightly more economical than self-feeding, but lambs could be successfully self-fed provided adequate hay was furnished. Cut alfalfa hay had no significant advantage over whole hay. While rate of gain was increased with linseed meal, there was no advantage in economy of gains. With mixtures of corn and cut alfalfa hay containing less than 40 percent hay, it was necessary to provide additional whole alfalfa hay. A mixture of 75 parts corn and 25 parts oats proved satisfactory for self-feeding with alfalfa hay. A summary is given of previous experiments with lambs conducted between 1926 and 1938.

The value of various rations for fattening western lambs, C. HARPER (*Indiana Sta. Bul.* 470 (1942), pp. 15).—In experiments with lambs the basic grain used in all experiments was shelled corn. There was employed corn silage with clover hay fed every day or on the fifth day only. Cut and whole soybean hay, alfalfa hay, or clover hay were employed for comparison in another experiment. The results given indicate that limestone and steamed bonemeal were of little value when added to rations containing legume hays, but with other rations there were advantages in feeding the minerals. Tankages consisting of meat meal and processed garbage were not as efficiently utilized as cottonseed meal. There was no advantage for chopping the legume hays or cracking the corn from the standpoint of increased gains and market finish, although feeding the cracked corn with cut hay eliminated some of the digestive difficulties in lambs consuming excesses of concentrates. The studies employed 8 lots of 25 lambs each for three comparisons from 1935 to 1937 and three more from 1937 to 1940. Data were recorded on the rates of gains and feed costs on the different rations.

Sensory neuron degeneration in pigs.—IV, Protection afforded by calcium pantothenate and pyridoxine, M. M. WINTROBE, M. H. MILLER, R. H. FOLLIS, JR., H. J. STEIN, C. MUSHATT, and S. HUMPHREYS (*Jour. Nutr.*, 24 (1942), No. 4, pp. 345-366, figs. 6).—Continuing these studies (E. S. R. 80, p. 382), abnormal gait and sensory neuron degeneration were observed in pigs failing to receive pyridoxine or calcium pantothenate, alone or in certain combinations with each other and with vitamins of the B complex and A. The basal diet consisting of casein, sugar, lard, a salt mixture, and cod-liver oil with the B vitamins promoted normal growth and no nervous symptoms. Whole liver was found to be an excellent source of both pantothenic acid and pyridoxine. Frac-

tions were shown to differ in their potency for protection from the sensory neuron degeneration. Since there were no signs of nutritional deficiency in pigs given no riboflavin, nicotinic acid, or vitamin A, it was assumed these substances were supplied in sufficient amounts in the basal ration. A subacute inflammation of the colon occurred in animals which did not receive calcium pantothenate. Animals not receiving pyridoxine exhibited epileptiform convulsions and anemia in addition to the abnormal gait. The full symptoms were not generally observed in the absence of one or more of the vitamins. In these experiments with 3-7 pigs on each ration, a total of 118 pigs were fed from 87 to 448 days of age. It was concluded that both pyridoxine and pantothenic acid were necessary to maintain the integrity of the nervous system.

Confinement system of producing pork, E. L. HANSEN (*Agr. Engin.*, 24 (1943), No. 1, pp. 9-10, figs. 2).—Losses due either to death or to poor development of animals diseased as a result of contact with infected soil can be greatly reduced by proper methods of sanitation. Many farmers are raising hogs on concrete in order both to control sanitation and to conserve feed. Some farrow their pigs on concrete, take them to pasture for awhile, then fatten them on concrete. Others keep their hogs on concrete from farrowing to market. Faster, cheaper gains are reported by hog farmers who make use of concrete. One farmer obtains the high average of 275 lb. per hog at 6 mo. of age with 300 lb. of feed for each 100 lb. of gain.

Expensive construction is unnecessary. Many farmers are making use of buildings and feeding floors already on the farm. Others need only a concrete feeding floor.

Home pork production, J. SMEDLEY (*New York: Orange Judd Pub. Co.*, 1942, pp. 134, figs. [27]).—A popular treatise on breeding, feeding, and management of swine and slaughtering and curing pork.

Recent developments in the nutrition of horses, I. P. EARLE (U. S. D. A.). (*North Amer. Vet.*, 23 (1942), No. 10, pp. 641-649).—The needs of horses for roughages and the vitamins are presented.

Indiana stallion enrollment.—Report of stallion enrollment board for the year 1941, with lists of stallions and jacks enrolled (*Indiana Sta. Cir.* 272 (1941), pp. 48, fig. 1).—The usual report (E. S. R., 85, p. 804) of stallions and jacks enrolled in Indiana, with discussions of the horse situation.

The United States Morgan Horse Farm, R. W. PHILLIPS, D. A. SPENCER, S. R. SPEELMAN, W. H. BLACK, J. O. WILLIAMS, and I. P. EARLE (*U. S. Dept. Agr., Bur. Anim. Indus.*, 1942, A. H. D. No. 52, pp. [1]+12, fig. 1).—Brief accounts are given of the experimental breeding, measures of performance, and fertility in horses, cross-breeding and reproduction studies with sheep, breeding investigations with dual-purpose cattle, and pasture studies at the Morgan Horse Farm at Weybridge, Vt.

Essential factors in canine nutrition, W. C. RUSSELL (N. J. Expt. Stas.). (*North Amer. Vet.*, 23 (1942), No. 11, pp. 733-736).—There are listed as essential for the dog five vitamins—A, thiamin, riboflavin, niacin, and B₆.

The poultry and egg situation outlook for 1943, C. G. CARD (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 219-222).—Increased total poultry and egg production are suggested through improved breeding, feeding, and management practices.

Studies on the amount of animal protein required in poultry rations, L. C. NORRIS and G. F. HEUSER (Cornell Univ.) (*Flour and Feed*, 43 (1943), No. 8, p. 38).—In replicate experiments it was possible to compensate for a shortage of animal protein by increased amounts of soybean meal in the growth of chicks. Maximum growth was attained in cockerels to 8 weeks of age on

rations containing 3 percent fish meal with 60 percent protein and 25.5 percent soybean meal. A loss of weight occurred in the pullets on soybean meal alone, although as many eggs were produced and the hatchability was as good as when some animal protein was included. The loss in weight was prevented by additions of about 2 percent meat scrap with about 8 percent soybean meal in the ration.

Effect of the war upon protein needs of poultry, G. F. HEUSER and L. C. NORRIS (*Farm Res. [New York State Sta.]*, 9 (1943), No. 1, pp. 1, 3).—As little as 3 percent fish meal containing 60 percent protein promoted maximum growth in White Leghorn cockerels when the balance of the supplementary protein was obtained from 25.5 percent soybean meal. Although pullets laid normally and the eggs hatched well when soybean meal was given as the sole protein supplement, a loss of weight of the pullets occurred in a 30-week experiment. This loss was prevented when about 2 percent meat scrap was added to the ration.

Soybean protein as a source of amino acids for the chick, H. J. ALMQUIST, E. MECCHI, F. H. KRATZER, and C. R. GRAU. (Univ. Calif.). (*Jour. Nutr.*, 24 (1942), No. 4, pp. 385-392).—The principal growth-limiting deficiency of raw soybean protein was found to be methionine. At a 20 percent protein level supplied by raw soybeans, additions of 0.25 to 0.5 percent of methionine in the diet increased the percentage gain in weight of chicks per day from 2-3 percent to 6-7 percent, respectively. Heated soybean protein unsupplemented was able to support gains not far below the standard 7 percent level, but the rate of gain was slightly improved by further supplements of 0.13 percent methionine. No further benefits to the diet followed the inclusion of small amounts of choline, cystine, lysine, tryptophane, arginine, glycine, and gelatin as sources of other amino acids. These results were obtained with 29 lots of 8 chicks each fed from 1 week of age for 10-14 days on the raw and cooked soybean supplements with the different amino acids.

Feed mixtures for broiler production, H. D. POLK and C. E. BARNETT (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 1, pp. 4-6, figs. 2).—In three studies of the efficiency of protein sources for chick rations more economical gains were produced with proteins from animal and vegetable sources than from either alone. In rations with single sources of proteins which also included cottonseed meal, sun-dried shrimp meal, soybean meal, and meat scrap, machine-dried shrimp meal was the most satisfactory single high protein source in rations containing about 21 percent protein. This source of protein produced birds at 9 weeks of age that averaged only 0.65 oz. below those receiving a combination of cottonseed meal and machine-dried shrimp meal as the protein source which did the best of any of the groups. Cottonseed meal alone was the least satisfactory of the protein sources from the standpoint of average weight, slipped tendon, vigor, and condition. However, among 130 chicks fed meat scrap as the sole source of high protein in the three experiments there were 18 with slipped tendons and 10 rejects. The most economical gains were produced by a ration including protein from machine-dried shrimp meal, soybean meal, and cottonseed meal. Because of the high salt content, sun-dried shrimp meal was not as efficient as machine-dried shrimp meal. In the three experiments there were included 80-130 cockerels and 35-71 ♀s per lot.

A method of measuring pulse rate of domestic fowl, E. W. HENDERSON and H. E. HATHAWAY. (Mich. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 44-46, figs. 2).—Counts of the pulse rate of several breeds of fowls taken with an adapted amplified microphone-stethoscope and a dual speed recording machine indicated that the average pulse rate of fowls per minute was 370, with a standard deviation of ± 30.86 .

Body form in growing chickens.—II, Growth of Cornish Bantams, R. G. JAAP, R. PENQUITE, and R. B. THOMPSON. (Okla. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 11-19, figs. 4).—Continuing this series (E. S. R., 85, p. 658), the time required to produce averages of 2 lb. by ♂s and 1.5 lb. by ♀s was 8.5 and 7.5 weeks in White Wyandottes and 15 and 14 weeks, respectively, in Dark Cornish Bantams. Maximum shank length was attained at 15 weeks in ♀s of the Bantam and 16 weeks in White Wyandotte ♀s, while ♂s required 17 and 21 weeks, respectively. The shank length of Bantams was proportionally shorter than that of the Wyandottes. During the first 2-3 mo. the shanks in both breeds grew more rapidly than the body as a whole. Following the period of more rapid relative growth rate, the shank was depressed prior to its completion in size, making the relative growth of Bantams more like that of Wyandottes at the same age than at the same size. Similar ratios between the cube root of body weight and shank length remained the best single estimate of body form in chickens differing in size but similar in age. Shank body proportions at maturity appeared to determine their relative proportions at hatching but did not affect the relative changes which occurred with increasing age. The study was based on the growth and changes in proportions of the body weight and shank length of 75 Dark Cornish Bantams and 89 White Wyandottes at weekly intervals and by sexes during the first 20-24 weeks after hatching.

The effect of diethylstilbestrol on the plasma phospholipids of the cock (*Gallus domesticus*), E. V. FLOCK and J. L. BOLLMAN (*Jour. Biol. Chem.*, 144 (1942), No. 3, pp. 571-577, fig. 1).—When 1 mg. of diethylstilbestrol per kilogram live weight was administered to 15 mature cocks daily for 5 days, the phospholipids of the plasma increased continuously from a mean of 312 mg. to 1,952 mg. per 100 cc. of plasma 24 hr. after the last injection. They returned to normal within a few days, however. The ratio of choline phospholipids to cephalins was not greatly altered during intense production, since both participated in the normal increase occurring during the recovery period. There was a more rapid decrease in the cephalin fraction.

Effect of *Lactobacillus casei* ε eluate fraction on reproduction in the domestic fowl, W. W. CRAVENS, E. E. SEBESTA, J. G. HALPIN, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 106-108, fig. 1).—Continuing these investigations (E. S. R., 86, p. 667), the results of two experiments, although with small numbers of pullets, showed that both solubilized liver extract and a norite eluate of solubilized liver extract contained a factor or factors essential for normal development of the chicken embryo. Deficiency of the eluate fraction caused a more pronounced effect on hatchability than on egg production. With a norite supplement to the basal ration, a pullet came into egg production in 3 weeks and then stopped laying until 4 weeks after 0.2 percent inositol was added. Laying continued with inositol alone, but the eggs failed to hatch until the norite eluate was added.

Egg-production behavior of hens, W. C. THOMPSON (*New Jersey Stat. Bul.* 700 (1942), pp. 12, figs. 3).—The annual egg production of Single-Comb White Leghorn and Rhode Island Red hens in the Vineland egg laying contest in the first and succeeding years showed that capacity to continue egg production at reasonably high levels was a characteristic possessed by many fowls in both breeds. Variation existed for egg yield in succeeding years which was not related to the first year's egg production. Minimum standards of 225, 170, 150, and 130 eggs were chosen for the first, second, third, and fourth years' production, respectively, in Single-Comb White Leghorns. Frequent checking of non-trapnested flocks with the percentage of hen days on which eggs were produced is suggested for maintaining laying flocks at high production levels.

Gastric hydrogen ion concentration and acidity in the domestic fowl, D. S. FARNER. (Univ. Wis.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 79-82, fig. 1).—In connection with studies of the pH of the digestive tract of fowls (E. S. R., 88, p. 236), the mean pH of the gastric juice in the gizzards of hens on a ration of equal parts of corn, wheat, and oats was 2.05. Some diurnal variation existed, showing a tendency for the pH to be lower in the daytime and higher at night. The gizzard fluid was removed from 30 Rhode Island Red and Barred Plymouth Rock hens with trochar and syringe at various times of day and night.

Acorns of the willow oak, *Quercus phellos*, a source of vitamin A activity, T. R. KING and H. W. TITUS. (Va. A. and M. Col. and U. S. D. A.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 56-60).—In feeding experiments with growing Rhode Island Red chicks the inclusion of 1 percent of ground acorn kernels and shells of the willow oak in a deficient vitamin A diet was as effective in maintaining growth and viability as 108 μ g. of carotene in peanut oil per 100 gm. of feed. Growth was retarded by the inclusion in the diet of 40 percent of acorns but 20 percent and smaller amounts did not produce unfavorable effects. It was calculated that the willow oak acorns contained 180 I. U. of vitamin A per gram. The flesh of all chicks that received 2 percent or more of acorns in the diet was yellow in color, its intensity increasing with the percentage of acorns consumed. The studies were conducted in three experiments with 4 lots of 15-30 chicks each, fed from 45 to 60 days on rations containing 0, 0.5, 1, 2, 2.5, 5, 10, 20, and 40 percent acorns as supplements to a ration deficient in vitamin A (E. S. R., 77, p. 527).

The absorption and retention of carotene and vitamin A by hens on normal and low fat rations, W. C. RUSSELL, M. W. TAYLOR, H. A. WALKER, and L. J. POLSKIN. (N. J. Expt. Stas.). (*Jour. Nutr.*, 24 (1942), No. 3, pp. 199-211, fig. 1).—Continuing studies of the role of fat in poultry nutrition (E. S. R., 83, p. 672), the absorption by hens of carotene in the crystalline form was about 60 percent of the consumption on a normal ration containing 3.83 percent fat for about 70 days, as contrasted with about 20 percent absorption of similar amounts of carotene consumed by hens on a ration with the fat extracted to 0.07 percent. On normal rations hens showed an increasing tendency to absorb carotene as increased amounts were supplied, but the increased absorption was not shown on the low fat ration. Absorption of vitamin A was essentially the same with normal and low fat rations, and the percentage of absorption was not changed by increased amounts of vitamin A in the ration. A yellow pigment having the solubility properties of carotene, but according to spectrophotometric determination not carotene, appeared in the excreta of hens on the low fat rations. The amount served for correction of the yellow material on normal rations. There was a much greater retention of vitamin A in the liver when a normal ration was fed than on a low fat ration, as ascertained by liver assays 30 days after the cessation of vitamin A feeding. When amounts of carotene comparable to that in the feed were administered intravenously none was excreted with the low fat ration. In the conduct of the study, hens on normal and low fat rations were supplied with different amounts of crystalline carotene and vitamin A in the ration or intravenously with determinations of the amounts in the excreta. The hens were first depleted for 10 weeks without carotene, and then carried up to 79 days with supplements and finally for 1 mo. without vitamin A for liver analysis.

Ascorbic acid storage in vitamin A deficient hens, M. RUBIN and H. R. BIRD. (Md. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 53-55).—The ascorbic acid content of the livers and duodena of 16 hens on deficient vitamin A rations for

at least 11 weeks was as high as or higher than that from hens which received additional vitamin A or normal rations. It thus appeared that vitamin A deficiency did not interfere with ascorbic acid synthesis in the mature chicken as in cattle, as noted by Phillips (E. S. R., 84, p. 508).

Use of pure riboflavin in poultry mashes and concentrates, D. R. CLANDININ, C. W. TRAVES, and W. HENDERSON (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 12, pp. 650-651, 661).—No statistical difference was found in the fertility and hatchability of eggs from hens on an all mash ration including 7 percent buttermilk powder, and others which received no buttermilk powder in the mash but were given the amount of riboflavin estimated to be present and further protein at 1, 2, and 4 percent as fish meal, meat meal, and grain, respectively. The studies were conducted with 6 lots of 10 hens each.

Effect of vitamin B₆ on egg production and hatchability, W. W. CRAVENS, E. E. SEBESTA, J. G. HALPIN, and E. B. HART. (Wis. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 94-95).—The need of vitamin B₆ for normal reproduction by laying hens was demonstrated. Groups of three hens each received supplements of 0, 1, 2, 3, and 4 mg. B₆ per kilogram of ration over a 9-week period. Egg production, fertility, and hatchability decreased to practically 0 on the basal ration, but hatchability was nearly 100 percent with the supplement of 4 mg. of B₆ per kilogram of ration.

Dietary calcium and phosphorus levels and the vitamin D requirement of the chick, J. S. NOWOTARSKI and H. R. BIRD. (Md. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 72-78).—In two experiments the percentage of bone ash in chicks at 3 weeks of age was increased more by the addition of minerals to the basal mash than by the addition of 20 A. O. A. C. units of vitamin D per 100 gm. of the basal ration, and the bone ash was well within the normal range. Between 3 and 10 weeks the bone ash of chicks on high mineral rations without vitamin D decreased. High mineral levels were less effective than vitamin D supplements in promoting growth and preventing crooked breastbones. Optimum growth and bone ash were obtained without vitamin D with rations having calcium contents up to 4.42 percent to 3 weeks of age. When 5 units of vitamin D were added to a ration containing 3.6 percent calcium and 1.8 percent phosphorus, better growth, feed efficiency, and bone ash were induced to 10 weeks of age than with 10 units of vitamin D and a ration containing 1.7 percent calcium and 0.85 percent phosphorus. Growth, feed efficiency, and feathering were improved, and mortality, crooked breastbones, and perosis reduced by the addition of 0.1 percent choline to mineralized rations. The studies were conducted in two experiments with 10 groups of 36 White Leghorn cockerels in the first and 13 groups of 40 Barred Plymouth Rock × New Hampshire cross-bred chicks in the second. In each case part of the chicks were slaughtered at 3 weeks of age for bone ash determinations. Various supplements, which included deflorinated phosphate, ground oyster shell, K₂HPO₄, MnSO₄, 4H₂O, choline, and vitamin D, were employed. Records were kept of the weights, mortality, and bone ash at 3 and 10 weeks of age.

Edema in vitamin E deficient chicks, H. R. BIRD. (Md. Expt. Sta.). (*Science*, 97 (1943), No. 2508, p. 98).—Confirming the results of Dam and Glavind¹ that increasing concentrations of soluble salts in the ration caused an increased severity of edema in chicks on low vitamin E rations, it appeared that disturbances of the osmotic equilibrium were necessary in addition to vitamin E deficiency to cause generalized edema, since it was not produced on E-deficient rations until a NaCl solution was administered. The vitamin E content

¹ Science, 96 (1942), No. 2488, pp. 235-236.

of poultry mashes was estimated from their edema protective value. The relation of edema to hemorrhage in encephalomalacia, as pointed out by Pappenheimer et al. (E. S. R., 81, p. 696), is noted.

The origin and structure of the vitelline membrane of the domestic fowl's egg, E. H. McNALLY. (U. S. D. A.) (*Poultry Sci.*, 22 (1943), No. 1, pp. 40-43, figs. 2).—Histological sections of the ovary, larger follicle walls, and the vitelline membranes from the yolks of hens' eggs that had been laid showed the true vitelline membrane on the freshly ovulated yolk to be formed from the collagenous membrane of the follicle, which becomes swollen by contact with the oviduct secretions. The later thickening and toughening of the collagenous membrane protects the yolk against rupture.

Some characteristics of the ovomucin gel of egg white, E. H. McNALLY. (U. S. D. A.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 25-29, figs. 2).—Titration curves of thick and thin egg white from fresh and incubated eggs showed that ovomucin white was practically insoluble in distilled water. It gave reversible physical changes due to pH and salt concentrations, and was in a compact precipitated form when the pH was less than 6-6.4. Between pH 6 to about 8.5 the ovomucin swells to a gel and on increased alkalinity becomes a viscous mucus. The amount of acid neutralizing the material in the white of fresh and incubated eggs was similar.

Shell treatment of eggs by oiling.—I, Effect of time between production and oiling on interior quality of stored eggs, R. J. EVANS and J. S. CARVER. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 10, pp. 546-549).—The interior quality of storage eggs was best preserved and the air cell size held to a minimum by oiling on the day the eggs were laid. When longer periods of time elapsed between laying and oiling, or the eggs were not oiled at all, there were greater decreases in the albumen index during short storage periods at higher temperatures or longer storage periods at 26°-34° F. The greatest decrease of firm albumen occurred in unoiled eggs. The studies were conducted in three experiments with groups of 12-24 eggs with four and eight replications of oiling the eggs when gathered, at noon and the evening of the day gathered. Comparisons were also made of oiling on the first, third, and seventh day thereafter, or not oiling at all, with storage at different temperatures.

Does boiling change the weight of an egg or of the yolk or white? G. D. BUCKNER, W. M. INSKO, Jr., and A. HARMS. (Ky. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, p. 95).—The weights of whites, yolks, and shells of eggs from 10 Rhode Island Red pullets and hens when fresh and after boiling for 30 min. did not differ significantly. The greater weight of the hens' eggs than pullets' resulted mainly from an increase in the egg white.

Preservation of eggs, II-IV (Canad. Jour. Res., 20 (1942), No. 10, Sect. D, pp. 291-319, fig. 1).—Three papers in this series² are reported.

II. Surface contamination on egg-shell in relation to spoilage, F. T. Rosser (pp. 291-296).—No very close relationship was found between the external mold growth after storage for 6 weeks under adverse conditions of both temperature and humidity and the amount of mold contamination originally present on the shell. Internal spoilage as determined by candling was greatest at the end of the storage period for eggs having high initial shell counts. The spoilage was not reduced by dipping in oil before or after disinfecting the eggs in hydrogen peroxide.

III. Studies on the effect of oil treatment and egg-case liner bags in the preservation of shell eggs under adverse conditions, E. J. Reedman and J. W. Hopkins (pp. 297-305).—Oil treatment of eggs and packing in sealed egg-case liner bags

² (Canad. Jour. Res., 20 (1942), No. 3, Sect. D., pp. 57-70, fig. 1.

retarded the development of internal defects and severe external molds at 32° and 70° F. and about 90 percent humidity. The use of egg-case liner bags on untreated eggs in storage was detrimental. The position of eggs in the case influenced spoilage during the storage period. The importance of humidity was emphasized.

IV. *Storage of oiled and bagged eggs under constant and alternating temperatures and humidities*, N. E. GIBBONS, C. O. FULTON, and J. W. HOPKINS (pp. 306-319).—Within rather wide limits microbiological development in stored and oiled eggs was dependent primarily upon storage conditions rather than the amount of inoculum on the surface of the egg shells. Oiled and unoled eggs were stored at different temperatures and humidity, ranging from 60° F and 90 percent relative humidity to 80° and 95 percent relative humidity for 6 weeks. Three levels of shell contamination were introduced by dipping the eggs in saline suspensions of molds and bacteria. Oiling and bagging reduced internal mold and rot, and they were in better condition after storage than untreated eggs. The air cells were smaller, yolks freer, and less distinct yolk shadows were produced.

Storage changes in spray-dried whole egg powder, L. S. STUART, H. H. HALL, and E. E. DICKS. (U. S. D. A.). (*U. S. Egg and Poultry Mag.*, 48 (1942), No. 12, pp. 629-633, 658, figs. 2).—Preliminary bacteriological and chemical analyses on spray-dried whole egg powder incubated at 30° C. for 60 days at 13 relative humidities from 20 to 100 percent showed that the most important factor in the preservation of good quality during storage was the control of the moisture content of the product. Practically no bacterial and little mold growth occurred in samples stored at 90 percent relative humidity or less. Such samples contained less than 10 percent moisture concentrations. Chemical changes were noted in egg powder stored at the higher humidities which were associated with microbial activity. The recommendation for practice is the production of egg powder containing 5 percent or less moisture and adequate care in the handling to prevent moisture absorption. In the bacteriological studies determinations were made of the total bacterial counts, lipolytic organisms, molds present, and the coli index. The chemical determinations included the free fatty acids and total crude and free carboxyl groups before and after storage.

The management of turkey breeders, I, II, G. C. CRANDALL (*New Jersey Stas. Hints to Poultrymen*, 29 (1942), No. 6, pp. 4; 30 (1942), No. 1, pp. 4, figs. 2).—The general discussion of turkey production (E. S. R., 85, p. 808) is continued in two parts. In part 1 directions are given for caring for breeders, fertility and hatchability, use of artificial lights to stimulate egg production, and the yards and equipment needed for turkeys. Part 2 gives general directions for equipment and feeding, including two suggested breeder rations.

The relative efficiency of gains in weight made by male and female Bronze turkeys, E. M. FUNK. (Mo. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 3-10, figs. 4).—Differences between the economy of gains made by ♂ and ♀ Bronze turkeys were highly significant after 16 weeks of age. The ♂ turkeys required less protein per pound of gain from 17 to 30 weeks, utilized carbonaceous material more efficiently, and produced gains at smaller unit costs than ♀s. Males grew more rapidly than ♀s, and the rate of gain was related to the efficiency of feed utilization. Males required less feed per pound of gain, but the ♀s consumed a greater proportion of the less expensive feeds (grain). The study was based on weekly feed consumption and weights of 4 lots of about 25 birds of both sexes raised in complete confinement to 24 weeks of age in 1940, and 4 lots of 8-14 ♂s and ♀s raised in confinement to 30 weeks of age on rations of yellow corn and oats with access to mashes of 27, 32, 36, and 40 percent protein.

Perosis in turkey poults and the choline content of their diets, R. J. EVANS, M. RHIAN, and C. I. DRAPER. (Wash. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 88-93).—On several rations for poults the highest incidence of perosis with a perosis score of 5.71 (E. S. R., 88, p. 237) was produced on a high protein diet containing 25.6 percent pea meal and 22 percent casein. The occurrence of perosis was almost entirely eliminated by choline additions of 0.14 percent. There was a high negative correlation of -0.785 between the incidence of perosis and the choline content of the ration. Additions of 0.05 percent choline in the casein-protein diet caused a marked decrease in the incidence of perosis, but further additions of choline did not cause a reduction in the amount of perosis. Likewise, in another experiment with casein and extracted fish meal, supplements of choline to 0.15 percent reduced perosis, but above this level perosis was increased. Blood and bone phosphatase values showed no relation of the degree of perosis observed or the choline content of the ration. These studies were conducted in three experiments with groups of 15 day-old poults fed for 4 weeks on a perosis-producing basal ration, or with rations in which the protein was supplied from casein, meat scrap, extracted and unextracted fish meal, soybean meal, and pea meal, with and without choline supplements.

DAIRY FARMING—DAIRYING

[Papers on dairy production and the manufacture of dairy products by the southern experiment stations] (*Assoc. South. Agr. Workers Proc.*, 43 (1942), pp. 101-109, 111-125).—The results of reports on the following subjects were presented before the annual meeting in Memphis, Tenn., February 4-6, 1942 (E. S. R., 86, p. 373): A Method of Presenting Herd Analyses, by D. M. Seath and R. Lowe (p. 101) (La. Expt. Sta.); The Repeatability of Various Portions of the Lactation of Dairy Cows and Their Relative Value as Indicators of Permanent Productivity, by W. Gifford (pp. 101-102) (Univ. Ark.); The Influence of Rising Feed Prices Upon Our Milk Production Program, by K. M. Autrey (pp. 102-103) (Univ. Ga.); Sweet Potato Meal as a Milk-Producing Ration for Dairy Cattle, by Z. A. Massey (pp. 103-104) (Ga. Sta.); Irrigated Pasture for Dairy Cows, by C. E. Wylie, L. R. Neel, and J. A. Schaller (pp. 104-105) (Univ. Tenn. et al.); Seasonal Variation of the Vitamin A Content of Milk as Related to Pasture and Feeding Practices, by C. J. Koehn (pp. 105-106) (Ala. Sta.); Shark Liver Oil and the Vitamin A Potency of Milk, by L. L. Rusoff, H. E. Skipper, and P. T. D. Arnold (pp. 106-107) (Fla. Sta.); Vitamin "A" Requirements of Dairy Cattle, by A. H. Kuhlman (pp. 107-108) (Okla. A. and M. Col.); Lipolytic Activity of Bovine Mammary Gland Tissue, by P. L. Kelly (pp. 108-109) (Univ. Ark.); The Effect of Type of Cooler and Holding Time on Quality of Milk, by A. J. Gelpi et al. (pp. 111-112) (La. State Univ.); Bitterweed Studies, by F. H. Herzer (pp. 112-113) (Miss. State Col.); The Making of Cottage Cheese From Reconstituted Skim-milk Powder and the Quick Freezing and Storage of Cottage Cheese, by T. B. Harrison and W. Roberts (pp. 113-114) (Univ. Tenn.); A New Method for Manufacturing American Cheddar Cheese, by W. D. Saunders (p. 114) (Va. Sta.); Some of the Factors Affecting the Curing of Cheddar Cheese, by F. E. Hanson (pp. 114-115) (Tex. Sta.); Cheese Making Problems in the South, by L. K. Riggs (p. 115); Quality as Related to the Consumption of Dairy Products, by H. B. Henderson (pp. 115-116) (Univ. Ga.); Preliminary Report on the Storage of Frozen Cream, by T. R. Freeman and L. E. Mull (pp. 116-117) (Fla. Sta.); A Study of Cream Grading at Franklin, Kentucky, by H. B. Morrison and J. O. Barkman (pp. 117-118) (Univ. Ky.); Some Factors Affecting the Mold Content of Cream and the Mycelia Count of Butter, by T. J. Claydon (pp. 118-

119) (Univ. Ark.); Some Observations on Mold Mycelia in Cream and Butter, by S. C. Trzcinski and H. C. Olson (p. 119) (Okla. A. and M. Col.); Free Fatty Acids in Cream and Their Effects on Butter Quality, by E. L. Fouts (pp. 119-120) (Fla. Sta.); The Resistance of Fatty Acids to Neutralization, by P. E. Johnson and E. L. Fouts (pp. 120-121), and Comparative Value of Various Methods for Determining the Keeping Quality of Butter, by W. A. Krienke and E. L. Fouts (p. 121) (both Okla. A. and M. Col.); Some Observations on the Treatment of Parchment Wrappers With Sodium and Calcium Propionates for the Inhibition of Mold Growth on the Surface of Butter, by J. C. Olson and H. Macy (p. 122) (Univ. Minn.); The Effect of Feeding Cottonseed Meal as the Sole Concentrate on the Chemical and Physical Properties of Milk, by P. G. Miller (pp. 122-123) (S. C. Sta.); A Student Chapter of the American Dairy Science Association, by P. M. Reaves (p. 123) (Va. A. and M. Col.); Research in Dairying, by E. C. Elting (pp. 123-124) (U. S. D. A.); and Adequate and Economic Housing of the Entire Dairy Herd, by L. A. Higgins (pp. 124-125) (Miss. State Col.).

[Results of experiments on dairy cattle and dairy products at the Oklahoma Station] (*Oklahoma Sta. Bten. Rpt. 1941-42, pt. 1, pp. 34-37, figs. 2*).—Results are briefly reported on the use of prairie hay for dairy cattle, prairie hay as a source of vitamin A, cottonseed meal in place of corn for milk production, rancidity in individual cow's milk, and mold studies in cream and butter.

Growth studies with Ayrshire cattle.—I, Normal body weights and heights at shoulders for Ayrshire cattle, G. A. BOWLING and D. N. PUTNAM. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 1, pp. 47-52, figs. 2).—The birth weights, monthly body weights, and monthly height-at-shoulders for 242 Ayrshire females born at the Reymann Memorial farm from January 1927 to 1942 and for 165 Ayrshire males born during the same interval are presented and compared with similar data collected at the Missouri (E. S. R., 43, p. 876) and Iowa (E. S. R., 69, p. 100) Experiment Stations.

The oscillatory character of the variations in the weights of dairy heifers, G. A. BAKER and S. W. MEAD. (Univ. Calif.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 967-974, figs. 2).—The daily increases in weights of Holstein heifers receiving a nonroughage ration from 100 days of age were shown to be regular for about 193 days, but at the age of 293 days on April 1 the rate of daily gain increased and the variability of the daily weights markedly increased. Variance from the straight line regression in the first period calculated at 160.21 was significantly less than the variance of 233.09 for the second period. More of the variance was due to oscillatory variation in the first than in the second period. The variations in the weights of the older heifers were similar to those for yearling beef heifers on a normal alfalfa hay ration (E. S. R., 88, p. 515), indicating that the different behavior was a matter of age and not diet. Misleading conclusions could be derived from feeding trials based on weights at certain parts of the natural oscillations. It is, therefore, recommended that for short-time trials several animals be included with uniform environment and frequent weighings. The study was based on three consecutive weights at 10-day intervals on nine heifers from September 13 to March 24 and seven of them to August 21 with nonroughage rations.

Overcoming some of the dairy problems, E. WEAVER (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 211-215).—General suggestions for increasing total milk production to meet wartime goals and needs.

Balance the ration for most efficient milk production, G. WERNER and G. BOHSTEDT. (Univ. Wis.). (*Guernsey Breeders' Jour.*, 62 (1942), No. 12, pp. 1063-1065).—Practical directions for feeding efficiently with and without pasture and for balancing the rations for dairy cattle.

Efficiency of dairy rations containing various quantities of grain, K. M. AUBREY, C. Y. CANNON, and D. L. ESPE (*Iowa Sta. Res. Bul. 305* (1942), pp. 105-139, figs. 3).—In two series of experiments comparing three planes of nutrition for dairy cattle, roughage alone and limited grain rations supplied insufficient nutrients to meet the requirements of cattle consuming them, judging by weight losses. The loss was not the case with full-fed cattle. Statistical analysis of the relation of fat-corrected milk to digestible nutrients consumed showed highly significant differences in favor of the roughage-alone rations. The efficiency of the roughage rations decreased as the stage of lactation advanced. When calculated without regard to live weight changes, the average pounds of milk produced for each pound of digestible nutrients consumed above maintenance were 5.76 on roughage alone, 4.09 for the limited grain ration, and 3.2 lb. on the full grain ration. The first experiment was conducted with 15 cows divided into 3 groups, 2 of which were fed by the double reversal method for 7 weeks on roughage alone or rations containing 1 lb. of grain to 8 lb. of milk produced. The control group was fed throughout the three periods on rations of 1 lb. of grain for each 4 lb. of milk. The second experiment was conducted with 18 cows divided into 6 outcome groups by the method devised for variance analysis (E. S. R., 86, p. 668) and fed in periods of 6 weeks each. The rations compared were all roughage and 1 lb. of grain to 7 and 3.5 lb. of milk produced. In both experiments the cattle were allowed all the alfalfa hay and silage they would consume with daily records of milk and fat produced.

The effect of shark liver oil on milk and butter fat production, C. JENSEN, P. D. BOYER, P. H. PHILLIPS, I. W. RUPEL, and N. S. LUNDQUIST. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 931-937, fig. 1).—In three experiments with dairy cattle on adequate rations, feeding of high vitamin A potency shark-liver oil containing 15,400 or 26,650 units brought about a distinct rise in the blood plasma vitamin A, but there was a marked decline in the blood plasma and the milk carotene when vitamin A supplements were fed. The production of milk and butterfat and the percentage of butterfat were not influenced by the high vitamin A shark-liver oil feeding. Feeding as much as 90 cc. of the shark-liver oil per day tended to increase the normal rate of decline in production with advancing lactation.

Producing milk rich in vitamin A, J. H. HILTON, J. W. WILBUR, and S. M. HAUGE. (*Indiana Sta. Cir. 274* (1942), pp. 8, figs. 4).—Methods of feeding dairy cattle to insure high vitamin A values in the milk are described.

The effect of oxytocin on milk and milk fat secretion, J. C. SHAW. ([Conn.] Storrs Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 12, pp. 1051-1055, figs. 2).—The decrease in milk and fat secretion of four cows following oxytocin injections averaging 1.6 and 13.8 percent, respectively, was thought to be due to the more complete discharge of the mammary gland. Milking at 2-hr. intervals with the aid of oxytocin decreased milk fat secretion 11 percent in 24 hr. by inhibiting passage of blood fat into the glandular tissue. The secretion of milk seemed relatively constant and not influenced by removal of the milk at different intervals.

The addition of carotenoids as a means of maintaining a uniform color in milk as measured by the Lac-chrom-meter, E. B. WILLIAMS, L. H. BURGWALD, and R. G. WASHBURN. (Ohio Expt Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 12, pp. 1003-1014, fig. 1).—Readings by the Munsell "Lac-chrom-meter" as described by Baumann and Steenbock (E. S. R., 71, p. 94) of milk standardized to 5 percent butterfat showed the Guernsey milk to be consistently higher, followed in order by Jersey, Ayrshire, Brown Swiss, and Holstein. The color was generally lower until the cows were turned on green pasture, when there was

a greater increase in the color of Guernsey milk than in the milk of the other breeds. The peak of color was reached in 3 weeks with a decline until August, yet the carotene content of the milk actually increased. The color content of the milk was increased approximately one unit for each addition of 300 μg . of carotene per quart of milk. Additions of 450 μg . of carotene per quart were needed to make the color of winter milk equivalent to the maximum color of summer milk. The micrograms of carotene per quart of 5 percent milk needed to match Guernsey milk were 600 for Ayrshires, Holsteins, and Brown Swiss, and 450 for mixed herd milk, with 300 sufficient for the same milk after homogenization. The Lac-chrom-meter reading increased as the size of the fat globules was decreased by homogenization. Visual color did not increase in proportion to the Lac-chrom-meter readings. It was noted that these readings increased more as a result of homogenization than visual color, but when carotene was added the increase in visual color was proportionally greater than increases in the Lac-chrom-meter readings.

Normal variations in the amount of ascorbic acid in the blood of dairy cattle, A. L. BORTREE, C. F. HUFFMAN, and C. W. DUNCAN. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 983-990).—The average ascorbic acid content of the blood of 19 calves from birth to 12 mo. was 0.32 mg. per 100 cc. of plasma, of 4 heifers from 20 to 34 mo. of age 0.49 mg., and of 24 cows of various ages 0.44 mg. Marked differences in the ascorbic acid of the blood plasma of normal calves and lactating cows were found, but the fluctuations were not correlated with the periods of feeding or the time when the samples were taken. Random ascorbic acid determinations seemed of little value in indicating the blood concentration of this vitamin in dairy animals.

The heritability of butterfat production in dairy cattle, J. L. LUSH and F. S. STRAUS. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 975-982).—In continuing further studies of sire indexes (E. S. R., 86, p. 234), the heritability of differences between cows mated to the same sire was found to be 0.174. This indicates that two cows chosen on the basis of one record each will differ in their breeding values about one-sixth as much as their records differ. In selecting cows for high records their breeding values are about one-sixth above the average of the group from which they were chosen. The contributions of like environment caused a reduction from 0.174 to 0.140 for the heritability within a single herd. Breed differences were not found in heritability of differences. The 305-day records of 2,154 daughter-dam comparisons used in proving 283 sires in the Iowa Dairy Herd Improvement Associations served as the basis for the study. The numbers of daughters' records per sire ranged from 5 to more than 20.

Predicting 305-day yields from short-time records, C. Y. CANNON, J. B. FRYE, JR., and J. A. SIMS. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 12, pp. 991-999, figs. 2).—Full lactation records could be predicted from a single month's record or from a single day's record each month. Factors are presented for predicting the 10 months' butterfat production from any month's record or a test day's production in any of the months. The data are based on linear regression equations for the butterfat production records of 400 Holstein-Friesian cows in the station herd and 1,289 cows, mostly of the Holstein, Guernsey, and Jersey breeds in the Iowa Dairy Herd Improvement Associations. The different breeds showed similar lactation curves. The persistency index of the station cows was 92.3 and for the Dairy Herd Improvement Association cows 91. The standard error of estimate showed the fifth month to give the most accurate indication of the full lactation yield. The sixth, seventh, and fourth months' records proved next best in that order.

An artificial insemination schedule, J. P. LAMASTER (*Guernsey Breeders' Jour.*, 63 (1943), No. 3, p. 173).—The records of artificial insemination in the Clemson, S. C., dairy herd served as the basis for a schedule based on insemination late in oestrus with semen stored for 24 hr. or less.

War emergency plans for raising calves and heifers, E. S. SAVAGE, W. E. KBAUSS, and S. W. MEAD (*Holstein-Friesian World*, 39 (1942), No. 25, pp. 9-10, 36-37, 46).—The needs of calves and heifers up to calving are reviewed with recommendations of dry feed systems needed to produce satisfactory development with a minimum of whole milk and skim milk which may be diverted for emergency purposes.

The A B C of goat dairying, F. R. COUTANT (*Fairbury, Nebr.: Dairy Goat Jour.*, 1941, pp. 116, [figs. 58]).—General directions for milk goat production.

A cheap and efficient medium for the plate count of milk, H. BARKWORTH and J. G. DAVIS (*Jour. Hyg. [London]*, 42 (1942), No. 2, pp. 218-223).—In order to reduce the amount of peptone needed, comparisons of 20 different formulas for media to serve for bacteriological plate counts of milk were made. These were based on milk samples from 274 farms which showed that ease of counting could not be obtained with less than 0.2 percent peptone in the media. There were included in the samples employed varying percentages of peptone, yeastrel, lab-lemco, agar fiber, and dextrose.

Thermophilic and thermoduric bacteria, W. B. SARLES. (Univ. Wis.). (*Dairy Indus.*, 7 (1942), No. 11, pp. 279-280, 288).—Methods for the identification and freeing of milk of heat-resistant (thermoduric) and heat-loving (thermophilic) bacteria are presented.

A comparison of various methods for detecting thermoduric bacteria in milk, J. B. FISCHER and C. K. JOHNS (*Jour. Milk Technol.*, 5 (1942), No. 5, pp. 269-275, figs. 5).—The tube technic of Myers and Pence (*E. S. R.*, 85, p. 661) in comparative counts of 132 pasteurized milk samples from three plants gave results closer in agreement with plate counts than microscopic counts or their modifications tested. The method was considered more convenient than the plate or microscopic count. Differences in the results of other workers are explained by differences in the flora encountered. Thermoduric organisms interfered with the advantages of the resazurin test of Johns and Howson (*E. S. R.*, 83, p. 537) in pasteurized milk.

New tests on refrigerated milk: Bacteriological analyses in different strata in 10-gallon milk cans as a function of temperature, J. E. NICHOLAS and T. G. ANDERSON. (Pa. Expt. Sta.). (*Refrig. Engin.*, 44 (1942), No. 1, pp. 23-26, 50, figs. 6).—This paper reports the results of an investigation in which bacteriological analyses were made upon milk cooled (1) with a large amount of initially available refrigeration and the water bath in motion, (2) with a large amount of initially available refrigeration but no motion of the water bath, and (3) with both the milk can and water bath in motion simultaneously. Rates of cooling under each of these sets of conditions are shown, with some other refrigeration data.

When fresh milk was cooled to low average temperatures ranging from 34.5° to 38.1° F. the maximum increase in bacteria was found to be 7,340 and the maximum decrease 4,500. The ratio between the number of organisms in the fresh milk and the cream layer of the cooled milk was found to vary from as low as 5.5 : 1 to as high as 173 : 1. This difference in bacterial numbers results primarily from the filtration and subsequent concentration in the formation of the cream layer. Homogenized milk after cooling exhibited an apparent constant butterfat and bacterial content at all levels in the can.

The visual mold test under Kansas conditions, W. J. CAULFIELD, F. E. NELSON, and W. H. MARTIN. (Kans. Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 33 (1942), Nos. 9, pp. 28, 30; 10, pp. 36, 38-40).—Examination of 870 samples of cream collected at random from deliveries at eight Kansas creameries in different seasons showed that excessive amounts of mold as measured by the visual mold test were not a serious problem. This test alone was not a reliable criterion of cream quality. Organoleptic grade showed a pronounced drop in May as contrasted with July, due principally to weed and feed flavors. Of the total samples 26 percent were classified as second grade cream on the basis of organoleptic grade, while 9 percent contained doubtful or excessive amounts of mold, and 4.5 percent showed an excess of 0.80 percent and 21.6 less than 0.41 percent acid. Correlation of the visual mold test with the mold plate counts on these samples showed the visual mold test to be a reasonably accurate indicator of the mold content, and therefore a satisfactory criterion of the cream quality. However, there was little relationship between the development of molds and yeasts and the acidity of the product.

The role of oxidase-producing bacteria in the development of oxidized flavor in milk, J. F. CONE and C. J. BARCOCK. (U. S. D. A.). (*Jour. Dairy Sci.*, 26 (1943), No. 1, pp. 1-6).—There was a complete lack of evidence that oxidase-producing bacteria differ with respect to the cause of oxidized flavor in milk from other bacteria. When nine strains of oxidase-producing organisms were used for inoculation of sterilized milk known to be susceptible to the production of oxidized flavor it was found that no inoculated sample developed a greater intensity of flavor than uninoculated controls. The development of oxidized flavor was markedly or completely inhibited by very heavy inoculations. Studies were made of the oxidized flavor developed at 4°-6° C. in 2 to 4 days' storage of samples with and without 1 p. p. m. of copper. The samples varied from no inoculation or less than 100 to several million organisms per cubic centimeter.

The prevention of oxidized flavor in milk and ice cream by the use of concentrated milk products, O. M. RUSSELL and C. D. DAHLE. (Pa. Expt. Sta.). (*Jour. Dairy Sci.*, 26 (1943), No. 1, pp. 25-35).—In confirmation of the findings of Corbett and Tracy (E. S. R., 83, p. 393) and others, certain concentrated milks were found to retard oxidized flavors. High temperature after condensing was more effective in improving the antioxidant properties than similar temperatures before forewarming. Concentrated whole milk had a greater antioxidant effect than concentrated skim milk. When added to fluid milk before pasteurization the concentrated milk was more effective in retarding oxidation than when added after pasteurizing. Small amounts of condensed milk showed antioxidant effects on ice cream when it added only 8.75 percent milk solids-not-fat without contributing any deleterious effect on flavor. The studies were conducted on the influence of dry skim milk and condensed whole and skim milk on the development of oxidized flavors in pasteurized milk, skim milk powder, ice cream mixes, and reconstituted milk after storage up to 17 days and with and without additions of copper.

Effect of different pasteurization temperatures on keeping quality of butter made from cream containing naturally active lipase, E. L. JACK, N. P. TARASSUK, and E. L. SCARAMELLA. (Univ. Calif.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 12, pp. 16-18, 20).—Lipase activity in butter developed more especially as the period of storage at higher temperatures was prolonged and pasteurization of the cream was delayed. The lipolytic activity was ascertained by changes in surface tension, as indicated by Tarassuk and Smith (E. S. R., 84, p. 665). Special study was made of cream, milk, and butter samples after holding, with and without previous pasteurization.

Cheese making, J. L. SAMMIS (*Madison, Wis.: Cheese Maker Book Co., 1942, 10. ed., rev. and enl., pp. 322, 11 figs. 114*).—A revision of the book previously noted (E. S. R., 83, p. 104), presenting the modern methods of making different kinds of cheese and descriptions of them, with special consideration of cheese factory operators.

What can be learned from cheese grading clinics, W. V. PRICE (Univ. Wis.). (*Natl. Butter and Cheese Jour.*, 33 (1942), No. 12, pp. 12-13, 36).—Analyses of cheese scoring in cheese clinics showed that with 181 graders about 3 of their ratings in every 10 samples did not agree with the opinion of the majority. Attention is called to the value of cheese grading clinics, especially for educational purposes.

Factors affecting Swiss cheese starter activity: Effect of heat treatment and source of milk, M. E. TYLER and H. H. WEISER (Ohio State Univ.). (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 939-948, figs. 5).—Several factors seemed to be involved in the variations which occur in the activity of Swiss cheese starters. There seemed to be justification for the use of heating periods of the mother culture of 2-4 hr. or the use of higher temperatures, since they produced a decreased competitive microbial activity and a decrease in oxidation-reduction potentials. In the conduct of the study milk from different sources was heated at 80° C. for 1, 2, 3, and 4 hr., at 100° for 1, 2, 4, and 5 hr., and at 120° for 15, 30, 45, and 60 min. The milk was then inoculated with 1 cc. of different starter cultures per 100 cc. with incubation at 37°. Heat treatment of the milk at 80° did not affect the biological activity of the bacteria, but there was greater acid development following the longer heating period by most of the Swiss cheese starter cultures. The composition of the milk from different sources had a greater effect on the activity of the starter than heat treatment. In the investigations 18 pure and combined cultures were tested on milk from a single source.

The effect of copper on lipase activity in Cheddar cheese, I. HLYNKA, E. G. HOOD, and C. A. GIBSON (*Jour. Dairy Sci.*, 25 (1942), No. 11, pp. 923-924).—Copper in amounts of 2 and 5 p. p. m. was not an inactivator of lipase in Cheddar cheese manufacture in 10 comparisons in duplicate with the pancreatic lipase ranging from 0 to 2.5 gm. per 1,000 lb. The copper tended to suppress rancid flavor development in the curd stage, and there was less rancidity of the curd cheese containing copper than when no copper had been added.

The preparation of crystalline rennin, C. L. HANKINSON (*Jour. Dairy Sci.*, 26 (1943), No. 1, pp. 53-62, figs. 2).—As a result of 25 comprehensive fractionation experiments a crystalline rennin was prepared by dialysis and centrifuging which had from 6 to 7 times the activity of commercial rennet extract on a dialyzed-salt-free-dry-weight basis and from 18 to 21 times on a total nitrogen basis. Attention was called to the high sulfur content, the absence of iron, and the questionable contents of phosphorus and copper.

Study of short-time high-temperature pasteurization of ice cream mix, L. R. DOWD and E. O. ANDERSON (Univ. Conn.). (*Jour. Dairy Sci.*, 26 (1943), No. 1, pp. 37-46).—In these studies pasteurization of the ice cream mix at 180° F. for 19 sec., before or after homogenization, proved effective in reducing the bacterial colonies and did not cause the development of objectionable flavor. It did not appear to cause significant differences in the viscosity of the mix, bacterial counts, or quality of the ice cream whether pasteurization was conducted before or after homogenization. The body and texture of the finished ice cream was more dependent on the method of freezing than on the method of pasteurizing or length of aging. Mixes were pasteurized by the short-time and holding methods before and after homogenization, and determination was

made of bacterial colonies, phenol value, viscosity, freezing and whipping quality, and body and texture of the ice cream when frozen by the continuous and batch methods.

Sweeteners for ice cream, A. H. WHITE (*Canad. Dairy and Ice Cream Jour.*, 21 (1942), No. 10, pp. 44, 46, 48).—Up to 25 percent of the sucrose in ice cream mixes may be replaced by dextrose, other corn products, and by honey without impairing the food value or the quality of the finished product. Some changes in the hardening and holding temperatures may be necessary.

Comparative standardization of butter, cheese, milk, and ice cream flavor scoring, G. M. TROUT, P. A. DOWNS, M. J. MACK, E. L. FOUTS, and C. J. BABCOCK (*Jour. Dairy Sci.*, 26 (1943), No. 1, pp. 63-68, figs. 4).—Comparison with the scores of the official judges of the Students' National Contest in the Judging of Dairy Products showed that a selected panel of trained judges could evaluate designated flavor defects comparatively close to those of official judges for the different products. Establishing a standard for flavor defects with a numerical score showed the range of scoring of flavor defects found in butter and ice cream to be more standardized than those for milk and cheese.

VETERINARY MEDICINE

[Contributions on veterinary medicine] (*U. S. Livestock Sanit. Assoc. Rpt.*, 45 (1941), pp. 8-58, 63-110, 118-141, 150-191, 193-194, figs. 7).—Contributions presented at the annual meeting of the association in 1941 (E. S. R., 85, p. 664) include: Personal Survey of Wartime Animal-Disease Control in Great Britain, by A. Eichhorn (pp. 8-13) (U. S. D. A.); Bovine Tuberculosis Eradication in the United States and Its Resulting Beneficial Effects on Human Health, by J. A. Myers (pp. 14-21) (Univ. Minn. et al.); Equine Encephalomyelitis and Its Control, by R. A. Kelsner (pp. 22-27); Swine Influenza Experiments, by J. P. Scott (pp. 28-37) (U. S. D. A. et al.); Immunological Studies With Hog Cholera Tissue Vaccine (pp. 38-43) and Cell Changes in the Gall Bladder as an Aid in the Diagnosis of Hog Cholera (pp. 44-47), both by W. H. Boynton, G. M. Woods, F. W. Wood, and N. H. Casselberry (Univ. Calif. et al.); Equine Breeding Hygiene, by W. W. Dimock (pp. 51-58) (Ky. Expt. Sta.); Factors Affecting the Viability of Strain 19 *Brucella* Vaccine, by E. L. Love and C. K. Mingle (pp. 65-72) (U. S. D. A.); Bang's Vaccination—a Public Health Problem, by M. M. Rabstein (pp. 73-75); Undulant Fever, by H. M. Guilford (pp. 76-79); Report on Bovine Brucellosis Work, Including Calfhood Vaccination, by J. R. Mohler and A. E. Wight (pp. 80-86) (U. S. D. A.); Forum on Bang's Disease by W. Giltner et al. (pp. 89-110); Chemotherapy in the Control of Avian Coccidiosis, by P. P. Levine (pp. 118-120); A Plan to Combat Avian Tuberculosis Infection as Followed in Michigan, by C. H. Clark (pp. 121-126); The Reasons for Failures in Immunization Against Laryngotracheitis and Pox, by F. R. Beaudette (pp. 127-141) (N. J. Stas.); The Value of Blood Examinations in the Diagnosis of Bovine Tuberculosis, by R. A. Hendershott and C. B. Johnston (pp. 157-169); Time Has Proved the Efficiency and Value of Bovine Tuberculosis Eradication Work, by A. E. Wight (pp. 170-173) (U. S. D. A.); The No-Visible-Lesion Case Problem in Tuberculosis Eradication, by W. A. Hagan (pp. 174-179) (Cornell Univ.); and Studies on the Treatment of Wounds in Experimental Rabies, by H. J. Shaughnessy and J. Zichis (pp. 182-185).

Among the reports of committees presented are those on transmissible diseases of swine (pp. 48-50), meat and milk hygiene (pp. 63-64), Bang's disease (brucellosis) (pp. 87-88), transmissible diseases of poultry (pp. 150-154), parasitic diseases (pp. 155-156), tuberculosis (pp. 180-181), rabies (pp. 186-188), miscellaneous transmissible diseases (pp. 188-191), and biologics (pp. 193-194).

Microbiology and man, J. BIRKELAND (*New York: F. S. Crofts & Co., 1942, pp. X+478, figs. 35*).—The fundamentals of microbiology (pp. 1–130), infection and resistance (pp. 131–179), common infectious diseases (pp. 180–364), and the microbiology of food, milk, water, sewage, and soils (pp. 365–441) are considered in this textbook. The class schizomycetes (pp. 443–454), glossary (pp. 455–461), and a four-page list of references are included in an appendix.

Demonstration of serological types within the nonhemolytic *Pasteurella*, P. A. LITTLE and B. M. LYON (*Amer. Jour. Vet. Res., 4 (1943), No. 10, pp. 110–112*).—It was demonstrated in serological studies of 30 strains of nonhemolytic *Pasteurella* that these organisms could be definitely classified into 3 distinct types. The type specificity, virulence, and host origin of these strains were found to be unrelated. The protective property of therapeutic anti-*Pasteurella* serums was found to be correlated with the type specificity of the strains included in the immunizing mixtures. Anti-*Pasteurella* serums representing 3 serological types were the only serums which would consistently protect mice against all of the virulent, nonhemolytic *Pasteurella* studied.

Studies on the eggs of *Ascaridia galli* and *Heterakis gallinae*, R. O. CHRISTENSON, H. H. EARLE, JR., R. L. BUTLER, JR., and H. H. CREEL. (Ala. Expt. Sta.). (*Amer. Micros. Soc. Trans., 61 (1942), No. 2, pp. 191–205, figs. 10*).—Report is made of studies of the morphology, intracapsular development, thermal death points, effects of certain chemicals, and the longevity of the eggs of these nematodes in vitro.

In vitro and in vivo studies of gramicidin, tyrothricin, and tyrocidine, H. J. ROBINSON and O. E. GRAESSLE (*Jour. Pharmacol. and Expt. Ther., 76 (1942), No. 4, pp. 316–325*).—"Tyrocidine and tyrothricin appear to exert a marked bactericidal action on aerobic and anaerobic gram-positive bacteria in the absence of blood or serum. Under similar conditions gramicidin appears to be primarily bacteriostatic. In the presence of blood or serum, tyrocidine and tyrothricin lose their bactericidal properties whereas gramicidin retains its bacteriostatic properties. Under these conditions tyrothricin becomes primarily bacteriostatic, apparently by virtue of its gramicidin content. In vivo results indicate that when mice are infected and treated by intraperitoneal injection gramicidin and tyrothricin are active whereas tyrocidine is not. Gramicidin or tyrothricin are only effective when given in direct contact with the infecting bacteria. No protection was afforded to mice infected by intraperitoneal injection when treatment was given by oral, subcutaneous, or intravenous administration. Likewise, mice infected by vein were not protected by intraperitoneal treatment."

Anthrax: A review of sixty cases, with a report on the therapeutic use of sulfonamide compounds, H. GOLD (*Arch. Int. Med., 70 (1942), No. 5, pp. 785–821, figs. 13*).—A review is given of 60 cases of anthrax, and the sources of infection, yearly occurrence, distribution, clinical course, and methods of treatment are considered. In 21 cases treated with antianthrax serum 1 death occurred. To secure recovery large amounts of serum (200 to 2,200 cc.) were administered intravenously, an optimum dose sufficient to control the edema having been required in each case. Neoarsphenamine given in addition to serum was found to be of little or no benefit. In 42 cases of anthrax, treatment was with sulfonamide compounds, with excellent results in 39 cases. Sulfapyridine was found to be the most effective sulfonamide compound, followed by sulfathiazole and sulfadiazine, respectively. Because of complications arising from the use of sulfapyridine, sulfathiazole is considered the drug of choice, of which large doses should be given until edema is controlled. It is concluded that sulfonamide compounds are a safe and reliable substitute for antianthrax serum. They are easy to administer; their use materially shortens the period of hospitalization and disability; and they are economical.

Prophylactic effect of sulfaguanidine against ulcerative cecitis in rats, A. L. BLOOMFIELD and W. LEW (*Soc. Expt. Biol. and Med. Proc.*, 48 (1941), No. 1, pp. 363-368, fig. 1).—The addition of 0.5 percent of sulfaguanidine to the diet of a rat colony, in which the majority of the animals developed lesions of cecitis, produced no deleterious clinical effect nor visible gross lesions and even in the small doses used had a striking prophylactic effect against the development of ulcerative cecitis.

Prevention by succinyl sulfathiazole of ulcerative cecitis in rats, A. L. BLOOMFIELD and W. LEW (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 28-29).—In continuation of the work with sulfaguanidine above noted, succinyl sulfathiazole incorporated in the stock ration was shown to prevent completely the development of ulcerative cecitis in rats.

Culex tarsalis Coq. a proven vector of St. Louis encephalitis, W. M. HAMMON and W. C. REEVES. (Univ. Calif. et al.) (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 142-143).—In continuation of the work in the Yakima Valley, Wash., in 1941 (E. S. R., 87, p. 717; 88, p. 385) in which *C. tarsalis* was thrice found infected with the virus of St. Louis encephalitis, experiments are reported which have led to the conclusion that this species is a natural vector. This is said to be the first instance in which a mosquito has fulfilled the three criteria for incrimination as a vector in respect to St. Louis encephalitis virus. It is pointed out that the northern house mosquito has been shown to be capable of transmitting this virus in the laboratory, and that *C. coronator* Beyer has now been demonstrated to do so. In addition, these experiments have demonstrated that the chicken may serve as a satisfactory reservoir of virus. "This is undoubtedly shared by other birds, for we have previously shown that virus may be isolated from the blood of a dove following the bite of *C. pipiens*³ and unpublished work indicates that ducks may serve as reservoirs."

Encephalitis: Eastern and western equine and St. Louis types, as observed in 1941 in Washington, Arizona, New Mexico, and Texas, W. M. HAMMON. (Univ. Calif.). (*Jour. Amer. Med. Assoc.*, 121 (1943), No. 8, pp. 560-564).—In reporting further (see above) it is suggested that eastern and western equine and St. Louis encephalitis be classed as members of a group to be called the arthropod-borne virus encephalitides. The data presented are based upon a study made of outbreaks occurring in 1941 in Washington, Arizona, New Mexico, and Texas. Evidence was obtained indicating the presence of three and possibly four encephalitic viruses in Texas and of at least two in each of the other areas (two isolated from the Yakima Valley).

Complement fixation with the neurotropic viruses, W. P. HAVENS, JR., D. W. WATSON, R. H. GREEN, G. I. LAVIN, and J. E. SMADEL (*Jour. Expt. Med.*, 77 (1943), No. 2, pp. 139-153, fig. 1).—"Antigens capable of fixing complement specifically with the appropriate antibodies have been prepared from brain tissue of hamsters and mice infected with the viruses of St. Louis, Japanese, western, and eastern encephalitis and with the West Nile virus. The antigens were freed of the material which reacts with normal serum by means of centrifugation at relatively high speed. In addition, the infectivity of the preparation was destroyed by irradiation with ultraviolet light. Cross reactions were demonstrated by means of the complement-fixation technic with materials from animals infected with the viruses of eastern and western equine encephalitis. No relationship was detectable by this procedure between St. Louis, Japanese, and West Nile viruses. These findings emphasize the need for further investigation and correlation of the immunological reactions of the groups of neurotropic viruses, since the

³ Soc. Expt. Biol. and Med. Proc., 50 (1942), No. 1, pp. 125-128.

equine agents are apparently unrelated when studied by neutralization and cross-immunity tests while these methods provide evidence of the presence of common antigenic structures in the St. Louis, Japanese, and West Nile agents."

Studies on John's disease: Reactions to Johnin in sensitized guinea pigs, H. KONST and E. A. WATSON (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 34-44, figs. 8).—The relative effect of various routes and vehicles in the sensitization of guinea pigs to Johnin by the injection of John's bacilli was examined in approximately 1,900 intradermal tests with Johnins prepared in the Animal Diseases Research Institute in Quebec. The intraperitoneal application of a comparatively small dose of John's bacilli in animals treated 48 hr. previously with a suspension of Ca-phosphate introduced by the same route gave the most favorable results. Guinea pigs sensitized by this method were used with success for potency-determinations of Johnin purified protein derivative in intradermal tests carried out along the lines followed in the standardization of tuberculin.

Serological identification of Salmonella cultures, P. R. EDWARDS and D. W. BRUNER (*Kentucky Sta. Cir.* 54 (1942), pp. 35).—Variational phenomena which affect *Salmonella*, antigenic analysis, biochemical reactions, and standard strains of *Salmonella* cultures, of which there are 164 available for distribution, are reported upon.

Can larvae of Cochliomyia americana C. and P. mature in carcasses? A. L. BRODY and E. F. KNIPLING. (U. S. D. A.). (*Jour. Parasitol.*, 29 (1943), No. 1, pp. 59-60).—Observations on the development of screwworm larvae of various ages in carcasses screened and unscreened from attack by carrion-feeding insects are recorded in table form. It was found that larvae would continue to develop in carcasses even outdoors, but unless they were mature by the third day after death of the host they had little chance of continuing development, owing to competition with the many carrion-feeding larvae. Larvae 24 hr. old and in the early second stage were observed to molt to the third stage by the third day after death of the host, but even if recovered these young third-stage larvae never developed to adults. Under outdoor conditions carrion-feeding larvae usually overran the carcass by the third day after death of the animal, and screwworm larvae could no longer be observed even though they had been seen as vigorously active 2 days after death of the host.

Studies on the hemorrhagic sweet clover disease, IV-VII. (Wis. Expt. Sta. coop. U. S. D. A.). (*Jour. Biol. Chem.*, 138 (1941), Nos. 1, pp. 21-33, figs. 3; 2, pp. 513-527, fig. 1; pp. 529-534, fig. 1; 142 (1942), No. 2, pp. 941-955, figs. 5).—A continuation of these studies (E. S. R., 86, p. 249), part 3 of which has not been published, is presented as follows:

IV. *The isolation and crystallization of the hemorrhagic agent*, H. A. Campbell and K. P. Link (pp. 21-33).—"The hemorrhagic agent in spoiled sweetclover hay (*Melilotus alba*) has been isolated in a pure state, m. p. 288°-289°, from experimentally produced spoiled hays as well as from hays that killed cattle in agricultural practice. The substance has the empirical formula $C_{15}H_{12}O_6$. It is optically inactive. There are two acidic hydroxyls in the molecule. The acidity of the pure substance falls between that of the phenols and the carboxylic acids. A crystalline dimethyl ether $C_{15}H_{14}O_4(OCH_3)_2$ with a melting point of 168°-170° (physiologically inactive) has been prepared by methylation with diazomethane. In the pure state the substance has a low solubility in the ordinary organic solvents. It is insoluble in acid media. Basic solvents and dilute alkali effect solution readily (salt formation). The substance could not be characterized or identified on the basis of its behavior toward the usual identification reagents. Its occurrence in nature has not previously been reported. One and five-tenths mg. of the crystalline hemorrhagic agent cause

approximately the same reduction in the prothrombin level or activity of the plasma of standardized susceptible rabbits in 40 hr. as 50 gm. of the standard spoiled hay sample. Spoiled sweetclover hays produced experimentally from *M. alba* and those realized in agricultural practice contain approximately 0.003 percent of the hemorrhagic agent on the dry substance basis. The over-all yield of the substance in a fractionation scheme involving 16 steps approximates 66 percent of the quantity present."

V. *Identification and synthesis of the hemorrhagic agent*, M. A. Stahmann, C. F. Huebner, and K. P. Link (pp. 513-527).—Reporting further, proof is presented through degradation reactions and by synthesis that the hemorrhagic agent, $C_{10}H_{12}O_6$, m. p. 288° – 289° , present in improperly cured hay made from the common sweetclovers (*M. alba* and *M. officinalis*) is the dicoumarin, 3,3'-methylenebis(4-hydroxycoumarin). The chemical and physical properties of the naturally occurring and the synthetic products have been shown to be identical. The synthetic product has been shown to parallel the naturally occurring product in its capacity to reduce the prothrombin level (or activity) of standardized susceptible rabbits. The hemorrhagic condition characteristic of the sweetclover disease has been produced in various species of experimental animals by continued feeding of the synthetic 3,3'-methylenebis(4-hydroxycoumarin). The bearing of this study on the objectives of the plant geneticist to breed a low coumarin line of sweetclover and the possible value of the hemorrhagic agent to the physiologist and hematologist are discussed.

VI. *The synthesis of the δ -diketone derived from the hemorrhagic agent through alkaline degradation*, C. F. Huebner and K. P. Link (pp. 529-534).—It has been found that the " δ -diketone, $C_{17}H_{16}O_6$, formed in the degradation of the hemorrhagic agent from spoiled sweetclover hay, 3,3'-methylenebis(4-hydroxycoumarin), with 10 percent sodium hydroxide is 1,3-disalicyllylpropane. The δ -diketone was synthesized from phenyl glutarate via the Fries rearrangement. Its dimethyl ether, $C_{17}H_{14}O_2(OCH_3)_2$, was prepared by condensing *o*-methoxybenzoylacetate ester with methylene iodide and subjecting the intermediate dicarboxylic ester to hydrolysis and decarboxylation."

VII. *The effect of 3,3'-methylenebis (4-hydroxycoumarin) on the prothrombin time of the plasma of various animals*, R. S. Overman, M. A. Stahmann, W. R. Sullivan, C. F. Huebner, H. A. Campbell, and K. P. Link (pp. 941-955).

Mechanism of bradycardia in rats with thiamine deficiency, D. McEACHERN and D. BROPHY (*Soc. Expt. Biol. and Med. Proc.*, 51 (1942), No. 1, pp. 75-76).—The bradycardia of thiamine-deficient rats disappears when the auricles are isolated in vitro, this condition probably being of neurogenic origin.

The effect of sulfonamides on the urinary tract in small animals, E. C. KHEUN (*North Amer. Vet.*, 24 (1943), No. 1, pp. 30-33).—While sulfathiazole is the drug of choice in combating urinary tract infections, sulfanilamide even in relatively low concentration is effective in curing most of them.

Infection of newborn Syrian hamsters with the virus of mare abortion (Dimock and Edwards), K. ANDERSON and E. W. GOODPASTURE (*Amer. Jour. Pathol.*, 18 (1942), No. 4, pp. 555-561, pl. 1).—Record is made of morphological evidence of the experimental transmission of infection by mare-abortion virus (*Brucella abortus equi*) through three serial passages in newborn hamsters. It was found in the course of the investigation that this virus is infectious likewise for human amniotic epithelium, in view of which it must be considered a potential agent of disease in human beings.

The effect of Brucella abortus on the bovine udder and its secretion, A. C. EMMINGER and O. W. SCHALM. (Univ. Calif. coop. U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 100-109, figs. 7).—The authors have found

that the quality of milk from *B. abortus*-infected quarters is not significantly different from that of the normal product. Visible particles were not observed in the foremilk, and the pH, chloride content, leucocyte count, and saprophytic bacterial count were well within normal limits. A careful examination of the entire parenchyma of each infected quarter failed to reveal gross lesions. Histopathological changes were observed, however, in 17 of 19 quarters that had harbored *B. abortus* for periods varying from 16 to 324 days. These consisted of an exudation of neutrophils into the alveolar lumen, associated with fatty degeneration of the alveolar epithelium with a tendency toward desquamation of epithelial cells. More commonly, however, the microscopic pathology was characterized by a dense accumulation of lymphocytes and plasma cells in the inter-alveolar tissues. Epithelioid cells and giant cells were found in some instances. In the larger inflammatory foci, proliferation of the connective tissue elements occurred. In some instances the supramammary lymph nodes also contained histopathological changes.

Sulfaguanidine therapy in experimental bovine coccidiosis, D. C. BOUGHTON. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 66-72, figs. 2).—The results of the experimental treatment of experimental infections of bovine coccidiosis with sulfaguanidine are reported. "Favorable results were obtained in the case of *Eimeria bovis* infections when the drug was given daily (1) at the rate of 0.1 gm. per kilogram of body weight for a 3-week period beginning 2 days after inoculation and (2) in 5-gm. doses for an 8-day period beginning 13 days after inoculation. Treatment of *E. bovis* infections for 8-day periods begun 3 days before and 5 days after inoculation was not effective. Marked differences between treated and control infections were not obtained in the case of *E. alabamensis*." The relation between successful treatment and size of coccidial population is discussed. Distinctive features of the asexual stages of *E. alabamensis* and *E. bovis* are pointed out, and their possible significance in the present work suggested. It is concluded that sulfaguanidine gives promise of being useful against certain types of bovine coccidiosis.

Elmeria wyomingensis, a new coccidium from cattle, H. HUIZINGA and R. N. WINGER. (Wyo. Expt. Sta.). (*Amer. Micros. Soc. Trans.*, 61 (1942), No. 2, pp. 131-133, figs. 2).—Description is given of a new species of coccidium, from the alimentary tract of a calf, which has been found to be widely distributed in the area surrounding Laramie, Wyo.

Infectious bovine mastitis.—VIII, The control of Streptococcus agalactiae mastitis by a segregation program based on periodic laboratory tests, W. N. PLASTRIDGE, E. O. ANDERSON, and F. J. WEIRETHER [(Connecticut) Storrs Sta. Bul. 240 (1942), pp. 54, fig. 1].—This further contribution (E. S. R., 82, p. 103), presented with a list of 31 references to the literature, describes a procedure for the routine laboratory testing of milk samples for mastitis and the identification of mastitis organisms. Observations of five experimental herds employed in developing a control program based in segregation are reported under headings of laboratory procedures (pp. 6-20), establishment and maintenance of herds free from *S. agalactiae* (pp. 20-36), and *S. agalactiae* infection in first calf heifers (pp. 36-39). Practical information on the segregation program for bovine mastitis control appears as an appendix.

It is concluded that "with proper segregation, sanitation, herd management, and laboratory tests made at intervals of 3 to 4 months, the annual spread of *S. agalactiae* infection may be kept below 10 percent, and that if this is done the disease can eventually be eliminated from the average herd."

The preparation and use of sulfanilamide in iodized mineral oil for mastitis, D. A. SANDERS. (Fla. Expt. Sta.). (*North Amer. Vet.*, 24 (1943), No. 1,

pp. 40-42).—A description is given of the process of suspending powdered sulfanilamide in iodized mineral oil, which results in a preparation suitable for introduction into the udder by way of the teat canal. At the Florida Station this preparation has proved to be a valuable chemotherapeutic agent in the treatment of udder infections. See also earlier notes (E. S. R., 86, p. 531; 88, pp. 101, 681).

The value of udder infusion in the treatment of streptococcal mastitis in cows, S. J. EDWARDS (*Vet. Rec.*, 54 (1952), No. 48, pp. 499-500).

Effect of injections of Novoxil on the bovine udder infected with mastitis streptococci, G. R. SPENCER and B. A. BEACH. (Wis. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 45-49, 50, figs. 4).—The treatment of 3 quarters of the udders of 2 cows infected with *Streptococcus agalactiae* with Novoxil produced an acute clinical inflammation, with secretions containing abnormally large amounts of catalase and chlorides. The number of streptococci eliminated was reduced markedly, but a few were found in the secretion of all 3 quarters 16 days later, just before the cows were slaughtered. Post-mortem gross and histopathologic examinations disclosed acute inflammatory changes which were more severe in the 2 quarters clinically abnormal before treatment than in the quarter which was giving normal milk prior to the injections. Injection of 21 dry quarters of 6 infected cows resulted in the elimination of the infection in 11 quarters, with very little or no inflammation produced.

Infection of the bovine udder by Pasteurella septica, I. W. BURTON and J. W. EMSLIE (*Vet. Rec.*, 54 (1942), No. 39, pp. 387, 388).—A bipolar organism isolated from the mammary secretion of a cow which produced indole, fermented sorbitol, was not hemolytic, but was highly virulent for the rabbit is described under the name *P. septica*.

Establishment of infection with Trichomonas foetus in bulls by experimental exposure, D. M. HAMMOND and D. E. BARTLETT. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 61-65, fig. 1).—In the experimental work reported 5 bulls were exposed to *T. foetus* by introducing into the prepuce cotton pledgets soaked in vaginal washings from experimentally infected heifers and cows. Two became infected; 3 remained negative after a number of exposures by this and other methods. Thirteen bulls were exposed a total of 154 times by various methods not involving the use of pledgets. None became infected. No obvious clinical symptoms associated with trichomoniasis were observed in the experimentally infected bulls. Each bull was able to transmit infection to susceptible cows by service. The results indicate that there are distinct individual differences in natural resistance of bulls to infection with *T. foetus*.

The eradication of bovine tuberculosis, E. G. HASTINGS. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 25 (1942), No. 12, pp. 1057-1065).—A review of the first 25 years of work with bovine tuberculosis eradication.

A preliminary report on a treatment for fleece-worm infestations in sheep, E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 35 (1942), No. 6, pp. 896-898).—In work aimed at the development of a combination treatment that would kill the larvae and at the same time provide protection against reinfection, a high degree of protection was obtained with all the materials. Only one reinfestation occurred among 33 animals treated with the diphenylamine solution, and none occurred among animals treated with other combinations. When mixtures of benzene and diphenylamine or diphenylene oxide solutions containing turkey-red oil or Wetsit Concentrated were used, no reinfestations occurred. In addition to tests on artificially induced infestations, 14 natural infestations were treated with the combinations of benzene and diphenylamine or diphenylene oxide. No reinfestations occurred. The results indicate that benzene containing

approximately 15 percent of diphenylamine is an effective and convenient treatment for fleece worm infestations in sheep. Diphenylene oxide and *p*-nitrophenetole are indicated to be equal or superior to diphenylamine in preventing reinfestations, but since diphenylamine is used in the treatment of screwworm infestations this chemical would be most practical.

The worm burden of sheep on improved and unimproved hill pastures, G. REES (*Jour. Anim. Ecol.*, 11 (1942), No. 2, pp. 198-204, pl. 1, figs. 2).

Identification of eggs of nematodes parasitic in domestic sheep, K. C. KATES and D. A. SHORB. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 54-60, figs. 14).—The authors present photomicrographs of eggs of 14 common species of nematodes, together with descriptions of eggs of 15 species, and make suggestions which may assist in the accurate identification of these eggs.

Preliminary studies on the use of phenothiazine in the control of lung worms in sheep and goat, D. F. and M. W. EVELETH and R. GIFFORD. (Ark. Expt. Sta.). (*Vet. Med.*, 38 (1943), No. 2, pp. 63-66, figs. 4).—Preliminary studies of Arkansas sheep flocks indicate that lungworms are serious parasites in that State. The intratracheal injection of phenothiazine in glycerol and alcohol has been found to kill lungworms in vivo with a minimum of damage to the host. It is not advised to use intratracheal injections in sheep or goats suffering from advanced pneumonia or caseous lymphadenitis with or without pneumonic symptoms. Where reinfestation is taking place constantly it will probably be necessary to treat at frequent intervals.

Some procedures that affect the bacteriological quality of goat milk, C. S. BRYAN. (Mich. Expt. Sta.). (*Dairy Goat Jour.*, 20 (1942), No. 9, pp. 1, 3-7, figs. 13).—In annual examinations for 3 yr. of the milk and udders of the lactating goats in 27 herds containing 619 animals 1.6 percent were found to be affected with streptococcic mastitis. Two of the animals were eliminated from the herd. One recovered after treatment by infusing each half of the udder with a water solution containing 150 mg. of tyrothricin. Six recovered without treatment, and only 1 remained permanently infected. Staphylococcic mastitis was found present in 5 of the goats, 3 of which were eliminated from the herd, and the remaining animals made uneventful recoveries. An additional 10 were found to have noninfectious mastitis. In determinations made of the physical condition of the udder of each goat 92 percent of those without mastitis had udders that were considered normal on physical examination, an additional 4 percent had atrophied portions of the udder, and 4 percent more had indurated udders. Of the goats with staphylococcic infection of the udders, only 20 percent had normal udders, and only 7 percent of those with streptococcic mastitis had udders that were normal on physical examination. It was found that only 4 percent of the goats with no mastitis produced milk with a count of more than 1,000, while 12 percent of those with staphylococcic mastitis and 50 percent of those with streptococcic mastitis yielded milk with a count of more than 1,000. The data obtained are reported in detail in seven tables.

Sulfaguanidine in the treatment of infectious enteritis in swine, H. C. H. KERKAMP and M. H. ROEPKE. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 3-14).—The experimental work conducted with swine is divided into four parts, the first of which deals with a series of controlled experiments on the use and value of sulfaguanidine from the standpoint of the therapy of enteric infections. Part 2 concerns a series of cases treated under field conditions; part 3 pertains to a study of the blood, fecal, and urine concentrations of the drug when administered at different dose levels for various lengths of time; and part 4 to matters of drug tolerance and toxicity. The studies have indicated that sulfaguanidine possesses considerable merit as a therapeutic agent in the

treatment of the infectious enteric complex in swine commonly grouped under such terms as infectious enteritis, necrotic enteritis, etc. Sulfaguanidine when administered morning and evening as a suspension in a small amount of mash or thick swill at the rate of 0.75 to 1.5 gm. per 10 lb. of body weight per day gave favorable results. Those animals which would not eat were given the drug by capsule until they consumed sufficient food to permit the administration of the drug in a portion of the feed. In order to obtain high fecal levels of the drug as early as possible, particularly in the acute cases, the first dose given was always twice the usual dose of the drug. As a rule, the physical condition of the animals began to show improvement by the third to fifth day and the character of the feces returned to normal by the fourth to sixth day. Usually the drug was administered for a period of 6 to 8 days, which generally included a few days after the stools had returned to a normal consistency. A few animals treated with sulfaguanidine have shown remissions. It was not determined whether these remissions were due to reinfections or to the failure of the drug to eliminate the causative organisms of the original disease.

Isolation of western equine encephalomyelitis and hog-cholera viruses from supposedly hog-cholera immune swine. S. H. McNUTT and A. PACKER (Iowa State Col.). (*Vet. Med.*, 38 (1943), No. 1, pp. 22-25).—Report is made of the isolation of these viruses during the examination of 2 pigs, both from a herd of 56. That hogs are resistant to western equine encephalitis is indicated by failure to produce apparent symptoms in artificially exposed hogs, except in 1 baby pig, and by failure, except in one instance, to isolate the virus from the tissues of exposed individuals. That hogs may be infected under certain circumstances with western equine encephalomyelitis is shown by the isolation of the virus from a pig, death, and reisolation of the virus from 1 artificially exposed baby pig and an increased neutralizing effect of the serums of pigs which had been exposed to the virus.

The swine lungworm as a reservoir and intermediate host for swine influenza virus, III, IV. R. E. SHOPE (*Jour. Expt. Med.*, 77 (1943), No. 2, pp. 111-138).—Two further contributions are presented (*E. S. R.*, 85, p. 823).

III. *Factors influencing transmission of the virus and the provocation of influenza* (pp. 111-126).—Report is made of the results of a 3-yr. study of the lungworm as intermediate host for the swine influenza virus in which 98 transmission experiments, using 216 swine, were conducted. Negative results were obtained in 50, while in the remaining 48 transmission of swine influenza virus by way of the lungworm was demonstrated in 1 or more animals of each experiment. Irregularities in the results appear to be due not so much to lack of transmission of masked virus by the lungworm as to failure to evoke its pathogenic capabilities.

"The stimulus of choice that was most successful in the provocation of swine influenza consisted of multiple intramuscular injections of *H[emophilus] influenzae suis*. In several experiments pigs developed swine influenza virus infections 9 to 17 days after infestation with infected lungworms in the absence of any known provocative stress. In these instances an immune response of the swine to the lungworms themselves is suspected of having furnished the provocation. During May, June, July, and August swine prepared by the ingestion of lungworms carrying virus were absolutely refractory to the provocation of influenza, and they were relatively refractory in September and October. The masked virus was activated most readily during the first 4 mo. of the year. In a single experiment we succeeded in demonstrating by direct means the presence of swine influenza virus in the neighborhood of lungworms at the base of the lung at a time when the virus was not demonstrable anywhere else in the respiratory tract. Masked swine influenza virus was found to be present in lungworm ova

obtained either from the respiratory tracts or the feces of infected swine. In a number of instances masked swine influenza virus has been found to persist for over a year in lungworm larvae within the earthworm intermediate hosts, and in one case its presence was demonstrated after 32 mo. Two varieties of a single species of earthworm, namely, *Allolobophora caliginosa* f. *typica* (Savigny) and *A. caliginosa* f. *trapezoides* (Dugès), have been found separately capable of serving as intermediate hosts for virus-infected lungworms. Lungworm ova obtained from convalescent swine which are no longer carrying swine influenza virus in infectious form in their respiratory tracts contain masked virus."

1V. *The demonstration of masked swine influenza virus in lungworm larvae and swine under natural conditions* (pp. 127-138).—The presence of masked swine influenza virus was demonstrated in lungworm larvae from earthworms dug on midwestern farms. Swine influenza virus infections were provoked in 2 of 3 swine obtained from an Iowa farm during an interepizootic period. The evidence presented has been interpreted as indicating that the swine lungworm is the reservoir and intermediate host for swine influenza virus in the field. A concept of the epidemiology of swine influenza in which the causative virus is represented as being maintained and disseminated in a masked form by its lungworm intermediate host is presented.

The pathology of equine influenza, T. C. JONES and F. D. MAURER (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 15-31, figs. 25).—Report is made of a study based upon 150 post-mortem examinations selected from more than 4,000 cases of equine influenza available for clinical observation at a remount depot.

Gastralgia in a horse due to bot infestation, P. C. UNDERWOOD and G. DIKMANS. (U. S. D. A.). (*Vet. Med.*, 38 (1943), No. 1, pp. 12-13, figs. 2).—Report is made of a case of gastralgia in a horse, subsequently terminating in a ruptured stomach and death of the animal, due to heavy infestation of botfly larvae.

Histologic adaptation of the virus of fox encephalitis, J. C. BARTON and R. G. GREEN. (Univ. Minn. et al.). (*Amer. Jour. Hyg.*, 37 (1943), No. 1, pp. 21-36).

Coccidioidomycosis in wild rodents—a method of determining the extent of endemic areas, C. W. EMMONS (*Pub. Health Rpts. [U. S.]*, 58 (1943), No. 1, pp. 1-5).

The life cycle of four intestinal coccidia of the domestic rabbit, R. L. RUTHERFORD (*Jour. Parasitol.*, 29 (1943), No. 1, pp. 10-32, figs. 113).—Studies made of the endogenous cycles of the four species of intestinal *Eimeria* found in the domestic rabbit, namely, *E. irresidua*, *E. magna*, *E. media*, and *E. perforans*, show each to produce two types of merozoites. The completion of their endogenous cycles requires from 9 to 10 days for *E. irresidua*, 7 for *E. magna*, 6 for *E. media*, and 5 for *E. perforans*.

A bioassay technique for anthelmintics, J. H. WHITLOCK and C. I. BLISS. (Kans. Expt. Sta.). (*Jour. Parasitol.*, 29 (1943), No. 1, pp. 48-58, figs. 3).—Dosage-mortality curves were determined experimentally for the toxicity of carbon tetrachloride to artificial inoculations of *Nippostrongylus muris* in albino rats. When percentage kills were transformed to probits, the observations could be plotted linearly against the dose or log-dose, a relation similar to that observed for anthelmintics on parasitic nemas in vitro and for lethal drugs on other multicellular organisms. Since the percentage mortality was estimated from parallel untreated control groups, the standard calculation required certain modifications, which are described. The toxicity of the drug to albino rats was determined with a similar dosage-mortality curve, so that the dose of carbon tetrachloride killing predetermined percentages of both parasite and host could

be computed with a measurable precision. Based on these curves, two methods for evaluating anthelmintics are proposed.

Characteristics of the population available for bioassay of anthelmintics in *Nippostrongylus muris* infection in albino rats, J. H. WHITLOCK. (Kans. Expt. Sta.). (*Jour. Parasitol.*, 29 (1943), No. 1, pp. 42-47).—A standard technic for inoculating rats with uniform doses of *N. muris* is described and its error determined. Analysis of data from 110 rats divided into 11 groups and infected with uniform doses of infective larvae of *N. muris* revealed two types of variation in numbers of worms establishing themselves: (1) A within-test variation which was larger than the binomial but uniform and approximating the normal curve and (2) a between-test variation which was many times larger than the above and which was unpredictable. The results of these experiments show that under adequate statistical and biological control it is possible to predict with workable accuracy the number of worms in rats of a treated group expected in the absence of treatment from the number of worms in a parallel control group. Although part of the variation between and within separate tests was due to variation in the numbers of infective larvae injected into the rats, this did not explain the wide variation observed. More probably it was largely due to an interaction between host and parasite which has yet to be explained.

Diseases of chickens, J. R. BEACH and M. A. STEWART (*California Sta. Bul.* 674 (1942), pp. 151, figs. 56).—This practical contribution, which supersedes the publication previously noted (E. S. R., 75, p. 546), brings together the present knowledge of diseases of the domestic fowl and means for their control.

Control of respiratory diseases in poultry, H. VAN ROEKEL. (Mass. Expt. Sta.). (*Northeast. Poultryman*, 35 (1942), No. 6, pp. 14-15).

A superior medium for the hemophilic fowl coryza bacillus, D. W. GREGORY. (N. C. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 32-33).—The poor growth of the fowl coryza bacillus obtained in and on the commonly used media led to the search for a more satisfactory medium. Of those tested, the blood broth and liver filtrate gave good results, and the chicken infusion plus raw potato gave excellent results.

Sulfathiazole for colds in chickens, V. HEIMAN (*Vet. Med.*, 38 (1943), No. 1, pp. 26-28, figs. 3).

Avian pneumo-encephalitis, J. R. BEACH. (Univ. Calif.). (*Vet. Med.*, 38 (1943), No. 2, p. 46).—This is a partial summary of the results of an investigation of the widely distributed avian pneumoencephalitis in poultry which has been found to be due to a newly identified virus and is not related to the western equine or the St. Louis types of infectious encephalomyelitis. In hens affected with the disease the production of eggs practically ceased and had not returned after several months. Recovered chicks may be virus carriers. The mortality of the disease ranges from none to 21 percent.

Synergistic action of *Hemophilus influenzae suis* and the swine influenza virus on the chick embryo, F. B. BANG (*Jour. Expt. Med.*, 77 (1943), No. 1, pp. 7-20, pls. 2).—It was found that the synergistic effect of *H. influenzae suis* and swine influenza virus in the pig can be reproduced by the inoculation of these agents on the chorioallantoic membrane of 9- to 10-day-old chick embryos. "Two strains of human influenza virus that were studied failed to substitute for the swine virus in the synergistic reaction. No loss of synergistic effect was noted when the swine influenza virus was put through 11 chick embryo passages. Recently isolated and old stock strains of *Hemophilus* were equally able to enhance the effect of the virus. Heat-killed cultures of *H. influenzae suis* can be substituted for the bacterial component of the reaction. Infection of the embryo with swine influenza virus predisposes to infection with *H. influenzae suis*. The

combination of *H. influenzae suis* and swine influenza virus causes a selective destruction of the embryo lungs not produced by the individual components. The pneumonia exhibits the essential features of the natural disease."

Fowl-pox in domestic poultry, E. M. DICKINSON (*Oregon Sta. Bul.* 411 (1942), pp. 27, figs. 6).—This practical account includes the results of field tests of baby chick vaccination, the details of which are given in a series of tabulated data. In the field trials on 28 poultry farms highly successful results were obtained. Emphasis is placed on the fact that only fowl pox vaccine and methods of application that have proved successful should be employed. Baby chick vaccination is not recommended to replace successful programs of vaccination of older chickens. It may be helpful on poultry farms where trouble is encountered when the birds are vaccinated at an older age. From 500 to 800 baby chicks can be vaccinated in an hour with a crew of two or three persons including the vaccinator. They are usually vaccinated when moved from the brooder house to the range (8-12 weeks of age) or at about a month before egg production is expected (3.5-4.5 mo. of age). Turkeys are usually vaccinated when they are moved from the brooder to range at about 8 to 12 weeks of age. Turkeys to be kept for breeders should be revaccinated.

Experiments with greenmelk in chicken leukemia, E. L. STUBBS and R. O. BUTZ (*Poultry Sci.*, 22 (1943), No. 1, pp. 49-52).—Greenmelk, which is a commercial product containing a combination of succulent cereal grasses and buttermilk (vitamins, proteins, and minerals) which is reputed when used as a supplement to grain and concentrates to be useful in conditions leading to anemia, was tested in transmissible chicken leukemia. Five experiments including 54 chickens were used in greenmelk feeding and injected with transmissible leukemia. Thirty-eight of the chickens developed typical leukemia while 16 did not. Since this is about the usual number of takes in routine transfers of leukemia, the greenmelk had no effect in prevention or cure.

Serological studies on the avian leukosis complex.—**Preliminary report on complement fixation**, M. POLLARD, W. J. HALL, and A. EICHORN (*Poultry Sci.*, 22 (1943), No. 1, pp. 20-24).—The anticomplementary character of chicken serum led to an investigation in which it was found that the whole blood and tissues of strain A leucotic chicks, chick embryos, and turkey embryos when inoculated into adult turkeys will induce specific complement-fixing bodies for strain A leucosis antigen. Strain A leucotic chick and chick embryo blood also induced similar antibodies in guinea fowls. "Strain B leucosis, morphologically similar to strain A leucosis and originating from a case of neurolymphomatosis, induced complement-fixing antibodies which were indistinguishable from those induced by strain A leucosis, and vice versa. While whole blood from a case of uncomplicated neurolymphomatosis induced complement-fixing bodies in turkeys for both strains A and B leucosis, the inoculations of whole blood and liver-spleen emulsions from cases of spontaneous visceral lymphomatosis into turkeys failed to induce such antibodies against either A or B antigen. Pending verification of these findings it appears that some serological relationship exists between strain A leucosis, strain B leucosis, and neurolymphomatosis distinct from that exhibited by spontaneous, nontransmissible visceral lymphomatosis. All of the complement-fixing antibodies which were induced in turkeys and guinea fowls by the leucosis agents exhibited a relative thermolability, the critical temperature being 56° C. after 6 min." A method of differentiating some of the manifestations of the avian leucosis complex by serological procedure is suggested.

Directions for drawing blood samples for pullorum disease serum agglutination test, E. M. DICKINSON (*Oregon Sta. Cir.* 144 (1942), pp. [4], fig. 1).—A description of the procedure to be followed in the drawing of blood samples for use in the serum agglutination test for pullorum disease.

The practical application of the rapid whole blood agglutination test for pullorum disease, R. F. GORDON (*Vet. Rec.*, 54 (1942), No. 48, pp. 495-497, figs. 3).

The fowl tick (*Argas persicus*), a new vector of anaplasmosis, D. E. HOWELL, G. W. STILES, and L. H. MOE. (Okla. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 73-75).—In one of three experiments it was possible to transmit anaplasmosis of the cow by means of the fowl tick. Attempts to transmit the disease experimentally by means of the ear tick were unsuccessful.

Sulfaguanidine as a prophylactic during the period of acquirement of resistance by chickens to cecal coccidiosis, R. W. ALLEN and M. M. FARR. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 50-53).—In the experimental work reported sulfaguanidine administered in mash at a concentration of 0.5 percent for 3 days before and 14 days after young chickens were exposed to infection by means of inoculation and exposure to contaminated litter or by exposure to contaminated litter alone reduced markedly the mortality from cecal coccidiosis. Chickens so treated with sulfaguanidine and held on infective litter for 21 days after the cessation of treatment were fully as resistant to subsequent infection as the surviving untreated controls. The weight gains of chickens so treated and held on infective litter for 21 days after the cessation of treatment were not significantly different from those of surviving untreated controls.

The disinfection of baby chick shipping boxes with sodium silicate solutions, E. C. MCCULLOCH, S. A. FULLER, and L. M. KOGER. (Wash. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 4 (1943), No. 10, pp. 95-99).—Commercial water glass solutions (mixtures of $\text{Na}_2\text{Si}_2\text{O}_5$ with more alkaline sodium silicates) containing from 8.9 percent Na_2O and 28.3 percent SiO_2 to 14.5 percent Na_2O and 29 percent SiO_2 were found to be effective germicides against gram-negative organisms. The phenol coefficient of these solutions is between 0.1 and 0.2, the more alkaline mixtures being more actively germicidal. Painting baby chick shipping boxes, between each reuse and after rough scraping to remove most of the accumulated feces, with equal parts of commercial water glass solution and water is recommended where the boxes must be reused because of present shortages. When carefully done this treatment will kill the more common poultry pathogens except *Mycobacterium tuberculosis*, does not weaken cardboard boxes, and is not injurious to baby chicks shipped in treated boxes.

Perosis in turkey poults and the choline content of their diets, R. J. EVANS, M. RHIAN, and C. I. DRAPER. (Wash. Expt. Sta.). (*Poultry Sci.*, 22 (1943), No. 1, pp. 88-93).—Experiments with perosis in turkey poults, an affection known to be due to a deficiency of either manganese or choline, are reported upon. A high incidence of perosis occurred in both of two choline diets prepared by modifying the commercial turkey-starting diet. This perosis was not completely prevented by adding sufficient choline to raise the level to 0.2 percent in the diet. The need for another factor or factors for the prevention of perosis when these diets are fed is indicated. There appeared to be a high negative correlation between the incidence of perosis in turkey poults and the choline content of their diets for all of the groups fed diets not containing added choline. A very high incidence of perosis occurred on a 32 percent protein diet with casein and pea meal furnishing the supplementary protein. This perosis was largely prevented by the addition of choline to the diet. Blood and bone phosphatase values appeared to be in no way related to the degree of perosis in the poults or to the choline content of the diets fed.

Respiratory-nervous disorder in adult turkeys, H. A. HOFFMAN (*Calif. Dept. Agr. Bul.*, 31 (1942), No. 3, pp. 130-133).—Report is made of the study of

a disease of adult turkeys characterized by respiratory and nervous symptoms, which was reproduced in young turkeys and chicks by using unfiltered and filtered inoculum. A few tests indicate the possibility that the virus is not filtrable through a Seltz filter. Six cockerels were immunized by repeated doses of formalized tissue vaccine followed by repeated doses of virus. Pooled serums from these cockerels in doses of 1, 2, and 3 cc., respectively, provided temporary protection against lethal doses of homologous virus. The same serums protected against the virus of respiratory nervous disorder of chickens. Attempts to immunize chicks through the use of mixtures of serums and virus failed. The reasons for these failures were not investigated. Preliminary trials on the use of tissue vaccines inactivated by formalin and chloroform were not encouraging. The development of a highly potent serum indicates the advisability of further investigations of this as an immunizing agent. Also, trials in the use of serum and virus as immunizing agents are indicated. Details of the inoculum trials are presented in table form.

AGRICULTURAL ENGINEERING

Agricultural engineers on the food front, H. B. WALKER. (Univ. Calif.). (*Agr. Engin.*, 24 (1943) No. 1, pp. 5-7, 10, figs. 2).—This is a presidential address concerned largely with the viewpoint that while we have been building up the arsenal side of our war effort at an amazing rate, we have been quite indifferent to the true situation regarding our farm production units. "Agricultural surpluses from past years and a bountiful nature in 1942 have not helped to arouse public consciousness to the true situation. Yet a view of the food stocks on the shelves of our local grocery stores should be a reminder of the diminishing supplies of foods for local consumption." However, "regardless of the difficulties we may be called upon to face in our battle on the food front, we must keep on fighting, using our technical knowledge to the fullest in keeping farm machines rolling in the fields to produce every pound of food possible . . ."

Agricultural engineering suggestions for 1943, E. G. McKIBBEN (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 223-229, figs. 3).—Since some definitely needed new equipment cannot be obtained, every effort should be made to keep all equipment in working order and arrangements attempted for increased exchange of equipment between farmers. The author holds that, in general, any new equipment or materials which will reduce labor or aid in production should be purchased if available. In discussing buildings, fences, the use of electricity, field equipment, tractors, land development, etc., he emphasizes primarily time and labor saving and care in conserving equipment now in hand. A final section on conservation of life, products, and equipment stresses fire prevention and precautions against personal injury.

[Agricultural engineering investigations of the Bureau of Agricultural Chemistry and Engineering] (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt.*, 1942, pp. 36-43).—The main topics for which data are reported are farm structures for storing crops, equipment for fighting plant pests, machinery for conserving fertilizer, machines to increase production or reduce cost of crops, special equipment for mulch culture and for low-income farmers, ginning cotton for best fiber quality, making cotton bales better at gins, flax-pulling and flax-processing machines, equipment for cooling eggs on farms, and hemp-processing machines.

Western ground waters and food production, J. A. BIRD (*U. S. Dept. Agr., Misc. Pub.* 504 (1942), pp. 40, figs. 22).—This is a condensed, more or less popularized statement of the nature, use, control, and conservation of ground water, with reference especially to areas of arid or semiarid surface. The main captions

under which the present treatment is arranged are where water rules, ground water—what it is, ground-water law, ground water—how it has been used, and planning for better water-land use.

Surface water supply of the United States, 1939.—Part 3, Ohio River Basin, C. G. PAULSEN ET AL. (*U. S. Geol. Survey, Water-Supply Paper 873 (1941), pp. XI+578, pl. 1*).—This paper records measurements of stream flow for the year ended September 30, 1939.

Water supply of the Dakota sandstone in the Ellendale-Jamestown area, North Dakota, with reference to changes between 1923 and 1938, L. K. WENZEL and H. H. SAND (*U. S. Geol. Survey, Water-Supply Paper 889-A (1942), pp. IV+81, pls. 3, figs. 3*).—The Dakota sandstone underlies most of North Dakota and South Dakota and considerable parts of nearby States. Where the topography is favorable, as in the Ellendale-Jamestown area in southeastern North Dakota, wells that tap the sandstone flow at the surface. The history of the development of the use of artesian wells in this area is traced from the time of the first well drilled (1886) through a period of excessive draft and the introduction of control measures (restriction to beneficial use), and to present conditions in the area. The quality of the water is described as poor, the dissolved solids amounting to 2,200 p. p. m. or more, with a fluoride content sufficient to cause mottling of the teeth. Present use appears to be approaching a balance between the withdrawal of water from the basin and the perennial recharge to it.

Ground-water resources of the Willamette Valley, Oregon, A. M. PIPER. (*Coop. Oreg. Expt. Sta.*). (*U. S. Geol. Survey, Water-Supply Paper 890 (1942), pp. V+194, pls. 10, figs. 3*).—The northern segment of the main plain has both unconfined water, semiperched at shallow depth beneath the "prairies," and confined water in extensive pervious zones, which in one typical well are about 70, 120, and 220 ft. beneath the surface. The semiperched water bodies will not sustain large withdrawals for irrigation. The confined water, presumably derived from a catchment area to the south and east, supplies wells that yield as much as 1,000 gal. a minute, with maximum pumping lifts of about 60 ft. It would probably supply several or many times its present draft. The southern segment contains many lentils and tongues of clean gravel and sand that supply as much as 500 gal. of water a minute to wells of shallow or moderate depth and of the simplest construction. Efficiently constructed wells penetrating the full thickness of the deposit very probably would yield much more copiously. Beneath the flood plains of the Willamette River and its principal tributaries, the younger alluvium is highly pervious at most places. It supplies as much as 1,000 gal. of water a minute to wells of simple construction and would, doubtless, sustain a much larger aggregate withdrawal.

In chemical character the water from all the unconsolidated deposits of the Willamette Valley is satisfactory for most uses. Some waters contain an excessive amount of iron. At many places the bedrocks, especially the sedimentary rocks of marine origin, yield water of excessive hardness or so concentrated in dissolved mineral constituents as to be unsatisfactory for ordinary uses.

A method for determining the velocity of runoff water, A. W. COOPER and J. H. NEAL. (*Ala. Expt. Sta. and U. S. D. A.*). (*Agr. Engin., 23 (1942), No. 12, pp. 385-387, 389, figs. 6*).—Equipment now available, including two 15- by 50-ft. tilting plats, artificial rainfall set-up, etc., is described in some detail, together with the calibration of rainfall apparatus by a method developed by D. A. Parsons of the Soil Conservation Service and the method of determining velocity. Data enough to permit drawing definite conclusions have not been obtained, but the results show probable trends. In general, velocity of sheet or overland flow of water increased with degree and with length of slope. After rills had formed

in the Decatur clay loam, however, the velocity of flow became erratic and increased or decreased, depending on whether the water was flowing in rills or had spread out. No attempt has yet been made to correlate velocity of flow of the run-off water with the soil losses, because the soil losses decreased with length of rainfall application.

The use of current meters in measuring pipe discharges, C. ROHWER. (Coop. U. S. D. A.). (*Colorado Sta. Tech. Bul. 29 (1942), pp. 40, figs. 18*).—For current meter pipe discharge measurement the area-velocity product was too large, probably because the current meter did not measure the low velocities near the walls of the pipe, but the correction factor was constant under standard conditions for each size of pipe unless the velocity was sufficient to affect the registration of the current meter. The velocity became too great for accurate measurement at about 10 ft. per second in 12-in. pipe and at about 9 ft. per second in small pipes. The general law showing the relation between velocity of the water as measured by the meter and discharge for all sizes of pipe is given as $Q = (419A - 5)V$ in terms of area of the pipe and $Q = 1.815D^2 V$ in terms of the diameter of the pipe. The discharges computed by the formula $Q = (419A - 5)V$ were, in general, slightly closer to the actual discharges. A comparison of the observed and computed discharges for all tests regardless of conditions, except those with spiral flow, showed that 79 percent of the computed results were not more than 3 percent in error and 92 percent were not more than 5 percent in error. Of two equally satisfactory methods of integrating the flow with the current meter, the combination of horizontal, vertical, and circular integration is recommended because the discharge formulas are based on measurements by this method. Both Ott and Hoff rubber-propeller meters of the type tested were equally satisfactory in measuring pipe discharges.

A statistical analysis of the effect of length of pipe on the accuracy of the current meter measurements showed that the differences were not significant. Outlet pipes at least 6 ft. long are recommended, however, because an obstruction in the pipe or other disturbing factor has less influence in long pipes. Adding an elbow at the pipe inlet to simulate the condition found in pump discharge pipes did not affect the accuracy of registration of the current meters for pipe lengths greater than six diameters. A right-angle inlet in a horizontal plane materially affected the registration of the meter if the outlet pipe was 2.5 ft. long, but had little effect if the outlet pipe was 6 ft. long. Measurements of the Fort Collins laboratory pump discharge with the Hoff current meter when the discharge pipe was 6 ft. long checked the Venturi meter measurements if the gate valve was not more than half closed. Measurements of spiral flow with a current meter were found to be unsatisfactory. Straightener vanes in the pipe were effective in straightening the lines of flow in the pipe and in reducing the error in the current meter measurements to less than 3 percent. A slight slope in the discharge pipe did not affect the accuracy of the current meter measurements; neither did such roughness as would be caused by pitting due to rusting.

Movement of soil during tillage operations, S. J. MECH and G. R. FREE. ([N. Y.] Cornell Expt. Sta. and U. S. D. A.). (*Agr. Engin., 23 (1942), No. 12, pp. 379-382, figs. 6*).—Movement of soil by tillage implements moving up or down the slope was measured in boxes having removable ends to permit entrance of the implement at operating depth. For the up or down slope movement in tillage across the slope, soil boxes 4 ft. square and filled with soil to about 6 in. in depth were supported at one side by a chain hoist for slope adjustment and at the other by a platform scale, permitting up or down slope soil movement to be calculated in foot-pounds per foot of implement travel by the moment principle from the change in reading of the scale.

Soil movement downhill during harrowing and cultivating operations increased as the slope was increased. A duckfoot cultivator shovel operated on the contour produced soil movement downhill approximately equal to that when it was operated up and downhill. A reversible cultivator shovel operated on the contour produced greater soil movement downhill than when it was operated up and downhill. In contour plowing under field conditions there was very little actual difference in the amount of the soil movement on different slopes. Soil movement uphill on a slope of 16.9 percent when contour plowing and throwing the furrows uphill was 51 percent less than soil movement downhill when throwing the furrows downhill, but the width of cut was 20 percent less. No difficulty in turning furrows uphill when contour plowing a 16.9-percent slope was experienced. However, the angle of the furrow slices indicated that the upper limit of slope for turning furrows uphill was nearly reached. On a 20- by 100-ft. plat, turning the furrows downhill in contour plowing would produce soil movement 38 times as great as that represented by an erosion soil loss of 1 ton per acre from the plat when the unmeasured movement on the plat during the latter process is not considered. The bottom furrow on this plat, if turned downhill and off the plat into the catchment equipment, would weigh 892 lb., amounting nearly to 10 times the weight of soil equivalent to an erosion loss of 1 ton per acre. Turning furrows uphill during contour plowing was the only feasible form of operation that moved soil uphill to compensate to some extent for the unavoidable downhill movement during cultivating, harrowing, and erosion processes.

Lumber requirements on the farm, F. J. HALLAUER (*U. S. Dept. Agr., Forest Serv., 1942, pp. III+75, figs. 26*).—This publication is one of a series of progress reports on a Nation-wide Forest Service survey authorized by the McSweeney-McNary Forest Research Act of May 22, 1928. It analyzes and discusses the estimated farm lumber requirements for repairs and replacements of buildings, for miscellaneous purposes, and for new construction. The future need is discussed in sections on appraising the backlog of deferred farm building improvements, and higher building standards would require more lumber.

Report of the Administrator of the Rural Electrification Administration, 1942, H. SLATTERY (*U. S. Dept. Agr., Rural Electrification Admin. Rpt., 1942, pp. 19*).—This report takes up operations during fiscal year 1942, war research, rural electrification and the law, and the fiscal status of R. E. A. borrowers.

Production rating of farmers under wartime conditions, F. J. ZINK (*Agr. Engin., 24 (1943), No. 1, pp. 19-21*).—The author notes the need for a scale or measure of some sort, by means of which the farmer himself, and others, may state efficiency in definite terms, citing as an example of such a score sheet the New Hampshire extension economist's "yardstick for farm and labor efficiency," in which one work unit is equal to a 10-hr. day and a full-time work year would be from 275 to 325 work units. This New Hampshire score card offers the farmer a means of self-checking the crops and livestock produced, multiplying the numbers of each by a conversion factor to determine the total units of output in relation to the work units of input. The operator calculates the total work units required for his operation, which merely shows whether "a farm really needs more workers than it now has on the job," also, it will show if "a farm has more manpower than it needs." The author also includes and briefly discusses a farm production rating form suggested for use by selection boards as applying to individual farmers for 1-yr. periods.

Wartime allocation of farm machines, A. W. TURNER (*Agr. Engin., 24 (1943), No. 1, pp. 22-24*).—A farm production rating form basically similar to those proposed in the preceding article is suggested for use in connection with applications for machines. The form is designed to provide a complete production picture.

Its structure is briefly discussed, and its use is illustrated. The paper is a report of the American Society of Agricultural Engineers Committee on Wartime Allocation of Farm Machines.

Nation-wide farm equipment conservation program, S. P. LYLE. (U. S. D. A.). (*Agr. Engin.*, 24 (1943), No. 1, pp. 13-14, 16).—This is a general résumé of the current labor machinery situation created by induction of farm workers into the armed forces, absorption of many others by war industries, and the reduction of new machinery production to 20 percent of the 1940-41 average. An uneven distribution of productiveness among farms, of which one-third produce 84 percent of the total, one-third turn out 13 percent, and the remaining third contribute only 3 percent of the marketed surplus, is another phase of the agricultural war production problem here outlined. Some increase in production on the small, low-production farms may be expected, but most of the load of the required increase must rest upon the 2,000,000 farms now producing 84 percent, and some of their necessary increase in experienced personnel must come from the smaller, less efficient farms.

With reference to the farm machinery problem it is noted that a vigorous machinery conservation program is required, but a number of favorable factors influence the situation, the following being among those enumerated: The inventory of machines on farms is probably greater than at any previous year; there are more tractors on farms than at any previous time; a very large percentage of the machines on farms has been in use less than 3 yr.; a large percentage of farm machines have been kept in good condition in 1942; excellent repair shop and garage facilities are available throughout the country for servicing tractors and doing welding and other difficult repairs; most repair shops can deal effectively with the repair jobs during winter if orders are placed promptly and the work is spread over the dormant season; at the farm level of analysis each farm is fairly well equipped for most operations in its schedule of production, and most farm managers can make certain that their machines are ready for the 1943 work; etc. Other favorable possibilities noted are that of the sharing of labor and equipment resources, custom work, and the development of home-made equipment. The probability of an adjustment of farm product prices and wages is also included.

The rationing of farm machinery, L. L. NEEDLER. (U. S. D. A.) (*Agr. Engin.*, 24 (1943), No. 1, pp. 17-18).—The author, director of the U. S. D. A. Division of War Board Services, briefly sets forth progress thus far made in the planning of the distribution of the available supply, "much less than was purchased during the depths of the depression when manpower was abundant and the price of farm machinery was high in relation to the value of farm commodities." State quotas on nearly all the rationed items have been established after taking into account such factors as the historical purchase and use of equipment; to what extent the planting, cultivating, and harvesting of farm crops has been mechanized in the various States; the food goals, with special emphasis on the war crops; climatic conditions; recent trends of use; availability of farm labor; and other factors. The State war boards have been asked to break their State quotas down into county quotas. Some other details of the tentative plan of distribution are outlined. Custom operation is indicated as an important factor in the accomplishment of increased production with lowered equipment supply.

Rental rates for farm machinery, C. B. RICHEY ET AL. (*Agr. Engin.*, 24 (1943), No. 1, pp. 15-16).—The essential finding of this committee report is that a rental schedule should meet the following requirements: (1) Provide an incentive to the average farmer to rent out his machines when they have extra capacity which is needed in the neighborhood. To this end a reasonable margin of profit above the total cost of service at average usage must be provided. (2) Be concise,

easily calculated, leave little room for disputes, and be easily understood. (3) Compensate for differences in delivered prices in different sections of the country. (4) Compensate for differences in cost of use due to differences in amount of annual use in different areas. (5) Compensate for differences in rates of wear due to variations in operating conditions. (6) Be adapted to use by farm machinery dealers operating a rental business as well as by farmers.

The method used in arriving at such a schedule and a tabulation of the committee's results in terms of basic rental rates per hour per \$100 of original value, both for the first 5 hr. and for further periods, accompany the report, together with a table of basic assumptions and cost estimates.

Farm machinery in Britain's food production effort, J. A. S. WATSON (*Agr. Engin.*, 24 (1943), No. 1, pp. 11-12).—The author presents a brief outline of the British system of intensified agricultural production, outstanding features of which are the county war agricultural executive committees and the special sub-committees for the handling of machinery problems, the annual estimation of new machinery requirements, and the management of the machinery pool, the last-named consisting of equipment owned by government and under the complete control of the committee. Of this government-owned equipment he notes that in a typical county containing some 200,000 acres the pool might contain 100 tractors with appropriate numbers of plows, cultivators, disks, seeders, binders, separators, etc. The number of government-owned tractors is about 7 percent of the total in the country, but in counties of small farms, or of farms with small areas of cultivated crops (i. e., in mainly pastoral districts), the size of the pool will be proportionately large. By contrast, in counties of large farms which can provide full employment for one or more tractors the bulk of the necessary equipment will be owned by farmers themselves and the county pool will be relatively small. In a majority of cases the whole of the pool equipment is actually operated by the committee's own employees and carries out custom work for farmers at fixed rates. Obtainment of a new machine by an individual purchaser is by application to the county committee, of which the "machinery officer" ascertains either (1) that there is full work for the implement in question on the applicant's own farm or (2) that the applicant is willing to register as a contractor, and that there is full work for the implement on his own farm and those of his neighbors, and gives the application an "A" priority rating; or is not satisfied as to these conditions and rates the application "B" or "C". It is, however, "very rare for a B priority to produce any response." Some control measures applied in the farm machinery industries to insure concentration of effort upon the types of machines most needed at the moment are also briefly noted.

The effect of the jacket water temperature on crankcase dilution and fuel economy of a tractor engine, A. H. THOMPSON. (*Univ. Ark.*). (*Agr. Engin.*, 23 (1942), No. 12, pp. 383-384, 389, figs. 5).—By arranging two radiators in series and providing radiator curtains, temperatures at the outlet from the engine jacket to the first radiator could be controlled within 2° F. at temperatures as low as 100°. Tests were run with 73 octane gasoline burned with 5.9:1 compression ratio and cold manifold, with 33.5 octane distillate burned with 4.75:1 compression ratio and hot distillate manifold, and 73 octane gasoline burned with 4.75:1 compression ratio and distillate manifold with cold setting. An S. A. E. No. 30 oil was used. Tests for the determination of crankcase dilution were run 5 hr. with a load of 18 hp. and an engine speed of 1,700 r. p. m., and the jacket water temperature was varied from 100° to 200°.

When distillate was burned, the lubricating oil was diluted as much as 14.4 percent in 5 hr. at 100° jacket water temperature. At 200° the lubricating oil was diluted only 5.6 percent in 5 hr. The rate of dilution was increased 1.9 times

by changing the jacket water temperature from 200° to 175°. When gasoline was burned, dilution of the lubricating oil by the fuel was considerably less than when distillate was burned. However, gasoline dilution in 5 hr. was doubled when the jacket water temperature was changed from 200° to 100°. There was less dilution when gasoline was burned with a 5.90:1 compression ratio and cold manifold than when it was burned with a 4.75:1 compression ratio and distillate manifold. The oil dilution was 40 percent more at the end of 5 hr. when distillate was burned with the jacket water temperature at 200° than when gasoline was burned with the jacket water temperature at 100°.

In the fuel consumption tests it was found that when distillate was burned the engine detonated rather severely when a load of more than 18 hp. was applied. No detonation occurred at any time when gasoline was burned. In almost every test decreasing the jacket water temperature resulted in increasing the specific fuel consumption. The jacket water temperature was varied from 100° to 200° in 25° steps, but the increase in fuel consumption was small for each temperature change and there was no consistency in the change in fuel consumption for each 25°-temperature step made. When distillate was burned, a change from 200° to 100° in the jacket water temperature increased the specific fuel consumption only 6.6 percent when the engine was developing 14.5 hp., but when the engine was developing 3.6 hp. the same change in jacket water temperature increased the specific fuel consumption 12 percent. When gasoline was burned with a 4.75:1 compression ratio there was a considerable increase in the specific fuel consumption when the jacket temperature was changed from 200° to 100° for all the different engine loads. When gasoline was burned with 5.90:1 compression ratio a change in jacket temperature seemed to have a greater effect on the specific fuel consumption as the load on the engine decreased. At maximum load changing the jacket water temperature had practically no effect on the specific fuel consumption, but when the load was decreased to about 6 hp. the specific fuel consumption was increased 10 percent when the jacket water temperature was decreased from 200° to 100°.

How to make a thresher for castor beans, J. B. KELLEY (*Kentucky Sta. Cir. 53 (1942), pp. 4, figs. 2*).—In the machine here described the pods pass between a revolving wooden cylinder (11.5 in. in diameter, 18 in. long, and covered with corrugated rubber floor matting, of which the corrugations are laid parallel with the axis of the cylinder) and a floor matting apron of which one end is tacked to the top edge of an adjustable board in the bottom of the hopper and in front of the cylinder. The other end of the apron passes over a 3- by 18-in. wooden roller and extends down into a removable drawer. The apron should be so cut that the corrugations will be at a slight angle with those on the cylinder. The wooden roller is mounted off center and is provided with a crank to turn it to adjust the space between the cylinder and the apron. At each end of the roller the bearing blocks are mounted between guides with one end of each resting against a ¾- by 3-in. compression spring. A ¼ hp. electric motor is used. An average rate of 183 lb. of cleaned beans per hour was obtained.

Develop a farm-sized rice drier (*Arkansas Sta. Bul. 428 (1942), pp. 17-18*).—Rice must be cut at a moisture content not much below 20 percent but cannot be stored safely at more than a 14-percent moisture content. E. L. Barger, K. Engler, and A. H. Thompson have built an experimental drier of a continuous-flow, tower type, of which a brief, partial description, without drawings, is here given. Air, heated by an oil-burning, domestic-type furnace, is delivered to the drier chamber by an electrically driven blower.

Baling straw left by combine, A. L. YOUNG. (*Univ. Ill. coop. U. S. D. A. et al.*) (*Agr. Engin., 23 (1942), No. 12, pp. 377-378, 389, figs. 2*).—Tests to com-

pare three methods of combining and saving the straw were made. (1) The 6-ft. combine was operated to cut with a low (5-in.) stubble, the straw was left in a windrow, and this windrow was baled with the pick-up baler. (2) The combining was kept as nearly as possible as in (1), but an attachment whereby two windrows of straw were thrown together was used. The baler had to travel much more slowly while picking up this double windrow, and occasionally the tractor pulling the baler had to be stopped momentarily until the pick-up baler and feed mechanism cleared. (3) The combine was operated to leave a stubble of normal height (from 11 to 14 in.), and the straw was left in a single windrow. The tractor pulling the baler (a tractor larger than that used in the other tests) was equipped with an 8-ft. mower having a curved bar windrowing attachment. The stubble left by the combine was mowed, and it, as well as the straw left by the combine, was delivered by the windrower to the pick-up of the baler. The total loss of grain was less when cutting with a 5-in. stubble than when the stubble was from 11 to 14 in. In this case the reduction of the cutter bar loss, due to lower cutting, more than offset the slight increase in the loss in the straw and chaff caused by the greater amount of straw. This would not always be so, however. If operating to secure a low stubble were to cause much green material to pass through the combine and to result in high grain losses and high moisture in the threshed grain, it would probably be more satisfactory to cut a high stubble, and mow the stubble as was done in test (3). The cost per acre should be slightly less for test (3) than for the other two because of the higher rate of travel and increased acres per hour harvested. It is considered doubtful if the saving in cost of combining when cutting the grain high as compared with cutting low would offset much of the increase in cost of saving the straw. Combining with a high stubble could not be justified when, as here, the total grain losses were more than when cutting low.

Plans for saving and straightening bale ties, F. E. PRICE and D. E. KIRK (*Oregon Sta. Cir. 145 (1942)*, pp. 8, figs. 3).—Detailed and fully dimensioned working drawings for an effective but simple and inexpensive bale tie straightener are reproduced in this circular and are accompanied by a bill of materials and brief discussion of the construction and operation of the device. The estimated cost of all required materials is \$1.

Sorting chutes, panels, hay self-feeders will make lamb feedlot operations easier, A. L. ESPIN (*Colo. Farm Bul. [Colorado Sta.], 5 (1943), No. 1*, pp. 6-7, figs. 3).—The plan of a chute, a dimensioned elevation drawing of a self-feeder for ground hay, and a drawing of a light fence panel for sheep feed lots, with brief descriptive legends, constitute the entire presentation of this topic.

Self-feeder, movable automatic waterer suggested as labor savers in hog growing, R. WILKES and H. C. DICKEY (*Colo. Farm Bul. [Colorado Sta.], 5 (1943), No. 1, p. 11, fig. 1*).—A tight barrel with both heads in good condition is placed on a watertight platform surrounded by a 4-in. ledge, the whole being mounted on two 4- by 6-in. runners 4 ft. long. The outlet at the bottom of the barrel is put at a height such as will place the top of the hole 1 in. below the top of the ledge. The barrel is filled through a stoppered opening at the top. The self-feeder here mentioned is not described, but its value and use are briefly discussed.

A program for postwar farm building, R. CROW (*Agr. Engin., 23 (1942), No. 12, pp. 373-376, figs. 2*).—"However important such a program would have been in the past, its successful prosecution during the immediate post-war period will be doubly so as a post-war economic measure." The raising of the farmer's efficiency and operational scope, with concomitant raising of living standard

and purchasing power, and the absorption of an appreciable part of the labor and material to be thrown on the market with the ending of war work are considered possible aids against the post-war depression anticipated by many economists.

Farm structures prefabrication, J. D. LONG (*Agr. Engin.*, 24 (1943), No. 1, pp. 8, 10).—The author defines precutting (of individual pieces to fit directly into the structure), prefabrication (of panels and structural parts), and pre-assembly (full completion of small units to be shipped as a whole), pointing out as advantages common to all three systems that they encourage better selection of materials for specific uses in the building; permit use of accurate, labor-saving shop equipment; permit shop fabrication under more comfortable and more effective working conditions than are usual in conventional construction; stop haulage of unnecessary and waste materials; by displays maintained by fabricator or his salesman permit the farmer to select the structure which most exactly meets his requirements, wishes, or pocketbook; permit the design to be controlled by the fabricator, presumably with qualified reasons, rather than left to the whim or tradition of the country carpenter; and allow economies in selection and utilization of materials and in labor which result in lowered costs to the purchaser, or superior quality at the same cost.

The author holds that prefabrication of farm structures has permanently established itself, and that, although it will not supplant conventional construction, it will prove "a worthy competitor" in some items of farm construction because it renders a distinct service to the farmer.

Emergency storage for soybeans, J. C. WOOLEY (*Missouri Sta. Cir.* 240 (1942), pp. 4).—Temporary structures for the storage of soybeans are not recommended. Conversion of corncribs and already existing bins is preferred to the putting up of temporary buildings. Because of the weight (48 lb. per cubic foot) and the mobility of the stored beans the side wall pressure is such that cribs should not be more than half filled. One-fourth-inch mesh wire cloth nailed inside the studding is recommended to provide air circulation. In buildings made for the purpose, side wall strength should be equivalent to that of 2- by 6-in. studding spaced 16 in. on center for storage of beans to a depth of 8 ft. Suitable joist sizes and spacing for various spans are also specified.

Beans having a moisture content of from 10 to 12 percent could be handled as are other grains, but a moisture content above 13 percent is considered not safe in storage. Arrangements necessary for obtaining materials and loans for storage construction are briefly discussed.

AGRICULTURAL ECONOMICS

Report of the Chief of the Bureau of Agricultural Economics, 1942, H. R. TOLLEY (*U. S. Dept. Agr., Bur. Agr. Econ. Rpt.*, 1942, pp. 15).—The work of the Bureau during the year is set forth, including work on production goals in 1942 and aid in establishing 1943 production goals. A discussion follows of critical commodities in the war effort, program analysis, problems of technology, production costs and returns, low-income farming, basic data for price-control measures, financial problems in wartime, production estimates and reports, participation of farmers in group discussions, keeping track of population and labor movements, and land values through periodic surveys.

Farming efficiently under war conditions, M. J. PETERSON (*South Carolina Sta. Cir.* 63 (1942), pp. 8, fig. 1).—Items discussed include labor efficiency and

income and ways of improving them, which consist of increasing the size of the farm business, better distribution and management of labor, efficient use of machinery, and changes in the farm lay-out and building arrangement. It is suggested also that debts be paid, new indebtedness avoided, and savings made through the purchase of war bonds.

Forecast of changes in California agricultural production in 1943 (as of January 5, 1943), R. L. ADAMS (*California Sta.*, [1943], pp. 32).—This report on forecasted changes in acreages of California crops, numbers of livestock, and production outlook of both crops and livestock is based largely on 149 replies to questionnaires sent to 194 persons on December 1, 1942. Opinions were obtained for 52 crop and 10 livestock enterprises.

Factors affecting farming returns in Jackson County, Florida, M. E. BRUNK (*Florida Sta. Bul.* 377 (1942), pp. 36, figs. 7).—The agricultural development of the county—population growth, number and size of farms, crop and livestock trends, number of farm conveniences, etc.—is described. The analyses of factors affecting farming returns are based chiefly on a farm management study of 490 farms in 1925, supplemented by data obtained in 1941. Some data from less extensive farm management studies in 1928, 1934, and 1935 were also used. The effects on returns of soils (by J. R. Henderson), location of markets, size of business, labor efficiency, crop yields, tenure, education of operators, prices, and cropping practices are analyzed and discussed. Real estate taxation in 1941 is discussed briefly.

Farm adjustment opportunities in Greene County, Georgia, M. C. CONNER, W. E. HENDRIX, C. R. SAYRE, and W. T. FULLILOVE. (Coop. U. S. D. A.). (*Georgia Sta. Bul.* 221 (1942), pp. 74, figs. 8).—"Using price and cost relationships at 1936-39 levels the bulletin outlines adjustment opportunities for representative farms for each major size-type group within the present land base available on such farms. In addition, it outlines family-sized units and the number of families which the county could support on such units if the restabilization and development of agriculture in the post-war time is to be on a family-sized farm basis." Data on land use, yields, and tenure were tabulated from 1938 A. A. A. work sheets for 1,026 operating units. Supplementary information regarding livestock was obtained through questionnaires. Visits were made to 185 farms selected at random to ascertain farm prices, costs, labor requirements, etc., and to 49 additional farms to obtain information on enterprises and practices found infrequently in the area. Detailed studies were made of representative farm organizations in each size-type group of farms. The area, its historical development, the present agriculture, etc., are described, as are also the production practices for crops, pastures, livestock, and woodlands. The organization and incomes of representative small, medium-sized, and large farms of different types and the reorganization of such farms with present acreages and to secure family-sized units are analyzed and discussed.

As regards adjustments with present land acreages, the authors state: "These adjustments, if made on all farms in the county, would result in about four times as large an acreage of non-soil-depleting crops and approximately twice as great an acreage of small grains. Such adjustments would contribute much toward the conservation of the county's land resources. At the same time they would provide an increase of \$118,000 in the total farm income. Such increase would make a substantial addition to the county's capacity for building and maintaining roads, schools, churches, and other service institutions. The welfare of both farm and nonfarm families would be benefited. With these adjustments enough surplus labor still remains during slack farming seasons

to perform 562,000 days of work, of which 284,000 days are suitable for field work. Utilization of such surplus labor in productive work is a major rural problem in the area."

As to adjustments to secure family-sized farms, they state: "Adjustments to secure a family-sized unit for all farm families in the county would increase the acreage of cropland from about 46,000 acres to 84,000 acres. This could be accomplished if most of the Class III land were brought into production. Total cash receipts would be increased from \$501,000 to \$953,000 and farm income increased from \$220,000 to \$461,000. This income, both because of the amount and the desirable distribution, would pay for many essentials now lacking for the well-being of farm people."

The management of farms in the limestone area of south-central Indiana, with special reference to the provision and utilization of pasture, F. V. SMITH (*Indiana Sta. Bul.* 473 (1942), pp. 51, figs. 6).—Farm management and land utilization studies in the limestone area have shown some of the more important farm management problems to be: (1) A large percentage of the land in the area is not adapted for efficient crop production; (2) a large percentage of the farms in the area are too small for economical units of the predominating types of farming followed; (3) the use of land not well adapted to the production of rotation crops coupled with intensive farming, made necessary because the farm units were too small, have caused a marked reduction in soil productivity, and a considerable acreage has been abandoned because of the loss of fertility and damage from erosion; (4) since a large percentage of the land in the area is better adapted to the production of grasses and legumes than to the production of corn and small grain, how does pasture fit into the more important types of farm organization in the area? (5) what pasture management practices, with reference to the establishment, maintenance, and utilization of pastures are practical?

This bulletin makes a detailed analysis of a successfully operated farm representative of each of five types of organization in the area. Special attention is given to the place of pasture on these farms. The analysis includes the management of a large, extensively operated farm, a large diversified farm, a 200-acre dairy-hog farm, a 160-acre diversified farm, and an 80-acre diversified farm. Soil types and land use, crop yields, livestock enterprises and pasture utilization, pasture costs, and pasture management practices are discussed, and tables are included giving a financial summary and the farm business factors by years 1932-36, inclusive. The procedure used in calculating pasture costs is briefly described.

Sizes and types of farms in relation to farm income in Quay County, New Mexico. P. M. McMains and P. W. Cockerill. (Coop. U. S. D. A.). (*New Mexico Sta. Bul.* 296 (1942), pp. 41, figs. 5).—The gradual adjustment in size of farm and ranch units in Quay County since early settlement is noted. The number of units has decreased, and the size has increased. The need is pointed out for a further reduction in the number of substandard farms and ranches in the interest of rural welfare and conservation of resources. Income is increased by the production of livestock in addition to row crops. Conservative grazing is recommended to obviate the hazards of forced sales of livestock in drought years.

Size of farm units as affected by the farming of additional land, R. C. HEADINGTON and J. I. FALCONER. (Coop. U. S. D. A. and Ohio State Univ.) (*Ohio Sta. Bul.* 637 (1942), pp. [1]+19, figs. 4).—A study of 300 farming units in 3 sample areas of Darke County for the period 1937-40 showed that the average farm unit had increased in size from 89.5 to 90.5 acres, while the number

of owners who were renting some additional land to farm increased 30 percent and the number of tenants who were doing likewise increased 44 percent. About 75 percent of the additional land was obtained by renting. The reasons given by 63 operators for renting additional land reflected the desire for more feed, pasture, cropland, and/or income. Ninety-three percent of the additional tracts were rented on a crop-share basis, 6 percent for cash, and the remainder by a combination of both methods.

Milk and egg production on farms, D. DICKINS (*Miss. Farm Res. [Mississippi Sta.]*, 6 (1943), No. 1, p. 8).—Data on milk and egg production of 832 farms in two counties in Mississippi showed that the production per family was less for 2-, 3-, and 4-family farms than for 1-family farms where an average of 883 gal. of milk and 199 doz. eggs per family were produced. It is recommended that milk and egg production per family be increased, especially on the large-scale farms.

Economic aspects of onion production in northern Indiana, L. ROBERTSON (*Indiana Sta. Bul.* 475 (1942), pp. 23, figs. 11).—Information regarding the methods used in producing onions and the costs and returns obtained were gathered from 35 to 65 representative farmers in the years 1934, 1935, 1938, and 1941. The production practices, labor requirements, seasonal distribution of labor, power requirements, costs and returns, and variations between years are described and discussed. The effects of prices, yields, and different production methods on returns are analyzed and discussed. Onion rental methods and cost methods used in the State are described.

The economics of the poultry enterprise on Kansas farms, R. W. HOECKER (*Kansas Sta. Bul.* 308 (1942), pp. 48, figs. 19).—In 1940, poultry on 87 percent of Kansas farms accounted for about 8 percent of the farm cash income. In 1941, receipts from 38 general-purpose flocks averaged \$4.17 per hen, while receipts from 33 egg-breed enterprises averaged \$3.98 per hen. Total operating expenses of the general-purpose flocks were \$2.35 per hen and in the egg flocks \$2.22 per hen. To care for 100 hens took an average of 1 hr. 22 min. a day, 150 hr. being spent in rearing replacements and 348 hr. on the laying flock. The average income from general-purpose breeds was \$1.83 per bird, while that from egg-breed flocks was \$1.56. More universal buying and selling of eggs and poultry on a graded basis is recommended as helpful in obtaining higher returns to Kansas farmers.

Trends in Kentucky agriculture, 1929-1940, D. L. MACFARLANE and M. M. THARP (*Kentucky Sta. Bul.* 429 (1942), pp. 51, figs. 10).—"To trace the trends in Kentucky agriculture from 1929 to 1940, particularly with respect to use of land, numbers and kinds of livestock, incomes, and attitudes toward and participation in the program of the Agricultural Adjustment Administration, data were gathered from census reports, from the State and Federal crop and livestock reporting service, from the Agricultural Adjustment Administration, and direct from some 500 farmers in 4 representative areas of the State." The trends in land use and number of livestock in the State as a whole and in each of the 8 type-of-farming areas and the changes in cash farm income during the period are discussed. Special analyses are made of the trends in land use and in farm organizations in Graves, Christian (southern part), Trimble, and Casey (upland and ridge portions) Counties. In a section on the trends in Kentucky agriculture in relation to the A. A. A. program, the aspects of farm practice, organization, and income on which the programs bear most directly are analyzed. These include "(1) measures of conservation achieved, (2) cover crop practices, (3) farm organization, tenure, and labor supply, (4) farmers' attitudes toward A. A. A., and (5) payments made to farmers under the A. A. A. program for 1939."

Farming in 1943, E. B. HILL and C. O. MAY (*Michigan Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 189-199).—The essentials of a good farm-management program for 1943 are discussed in sections on subsistence and commercial farms under present conditions, size of business to handle, the soils and crops program, the livestock program, and farm expenses in 1943.

A study of the newer hay harvesting methods on Ohio farms, F. L. MORISON (*Ohio Sta. Bul.* 636 (1942), pp. [1]+16).—This study covered 167 north-western and east north central Ohio farms on which one or more of the newer hay harvesting methods were used in 1941. Eighty-four operators used auto buck rakes and 53 had buck rakes mounted on tractors. Pick-up balers were used on 23 farms, stationary hay choppers on 10 farms, and forage harvesters on 3 farms. Twenty-six operators used hay loaders. The buck rake was the cheapest way of getting hay from the windrow to mow. The large field choppers put chopped hay into the mow at approximately a 30 percent increase in the cost over the stationary chopper-buck rake method. Gathering and storing the bales took almost as much man labor per ton as the baling itself. The economies of the different methods employed in the cutting, baling, and storing of hay are otherwise compared.

Cost of operating power equipment on Oregon farms, C. D. MUMFORD, V. D. KENNEDY, and G. B. DAVIS. (Coop. U. S. D. A.). (*Oregon. Sta. Bul.* 409 (1942), pp. 32, figs. 4).—Data were obtained on the operation of 358 tractors, 155 combines, 159 trucks, and 370 automobiles and pick-ups in studies made in the Willamette Valley in 1938 and 1940 and in a wheat farm operation study in two counties in the Columbia Basin in 1941. The studies were made by the survey method. The farms in the Willamette Valley in 1938 were selected at random, but those in 1940 were limited to farms where Austrian Winter peas or vetches were grown. The farms in the Columbia Basin were selected as typical farms by the county agents. Analyses were made of the costs and factors affecting the costs of wheel and track types of tractors of different sizes, of combines of different sizes, of trucks and pick-ups, and of farm automobiles.

The largest tractors were the more expensive to operate on the basis of cost per hour but the cheapest on the basis of cost per horsepower hour. Use during the season and age were the most important items explaining the differences in cost per hour of operating tractors, season's use being the more important. In the Willamette Valley the "5-ft." power take-off combines were the cheapest to operate per acre and the "8-ft." combines with engines the most expensive. In the Columbia Basin the "20-ft." machines cost the least per acre and the "14-ft." machines the most. The cost of operating trucks and automobiles was affected materially by number of miles driven and age of machines. The older machines driven the most miles were generally the cheapest to operate if such factors as speed, efficiency, and dependability are not considered.

A history of livestock raising in the United States, 1607-1860, J. W. THOMPSON (*U. S. Dept. Agr., Agr. Hist. Ser.* 5 (1942), pp. VIII+182).—This history of animal husbandry in the United States includes chapters on the European background of American livestock; stock raising in Colonial New England, the Middle Colonies, the Southern Colonies, and in the United States, 1775-1830; the opening of the New West; the Spanish Southwest and California; the beginnings of stock raising in Oregon Territory and Utah, and stock raising in the United States during the middle era, 1830-60. Included are an extensive bibliography of the literature cited and selected references published since the author's manuscript was completed.

Foreign Agriculture, [January 1943] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.* 7 (1943), No. 1, pp. 24, figs. 2).—An article, Australia's

Agricultural Resources, by W. I. Ladejinsky (pp. 3-21) describes the land and the people, topography, soils, climate, population, land use and tenure, etc.; the pastoral industry; and the production of wheat and other grains, hay, green forage, sugar, orchards and vineyards, tobacco and cotton, etc. The article attempts to reflect the real magnitude of the agricultural resources and to point out the factors limiting their expansion. It does not discuss the wartime agricultural problems. A second article, **Australian Agriculture and the War Effort** (pp. 22-24), discusses the pooling of agricultural reserves, the control of agricultural production and distribution, the conversion of production to meet war needs, and the reciprocal lend-lease aid being provided to the United States.

The agriculture of Colombia, K. H. WYLIE (*U. S. Dept. Agr., Foreign Agr. Bul. 1* (1942), pp. 160, figs. 45).—This is a comprehensive description and analysis of the present status and possibilities of agriculture in Colombia. It is based on many published works and many typewritten reports of the United States consuls in Colombia. The physical and economic background and the history, development, and general status of agriculture, including land policies, organization of the agricultural industry, self-sufficiency, and aids to agriculture, are described. The present status and possibilities for increasing the production of (1) export crops, especially coffee and bananas; (2) food crops—corn, beans, rice, potatoes, sugar, wheat, cacao, etc.; (3) raw-material crops—cotton, tobacco, fique, etc.; and (4) livestock are discussed. The section on foreign trade discusses the commercial policy, trade balances, exports and imports, the importance of the trade with the United States, the trade agreement with the United States, and the possibilities of expanding exports.

1942 summary of outstanding Federal and State legislation affecting rural land use, E. P. KILPATRICK and A. B. JEBENS (*U. S. Dept. Agr., Bur. Agr. Econ., L. E. Bul. 69* (1942), pp. [3]+44, fig. 1).—This summary includes the laws passed from January 1 to November 1, 1942. The Federal laws are grouped under the headings: Credit and insurance, grazing, marketing, services to agriculture, and water utilization. The State laws are grouped under the headings: Conservation, cooperatives, credit and insurance, forestry, Governmental cooperation, Governmental structure and administration, land tenure, marketing, public finance, public land administration, rural facilities, services to agriculture, taxation, water utilization, and zoning—planning. A State index is included.

Land ownership and operating tenure in Imperial Valley, California, A. POLI (*U. S. Dept. Agr., Bur. Agr. Econ., 1942*, pp. [2]+68, figs. 17).—The topography, soils, climate, population, irrigation development, and agriculture of the valley are briefly described. Land acquisition and settlement, types of land-ownership, size of ownership, instability of landownership pattern, types of farm operators, size of operating units, farm tenancy and related problems, and ownership-operating tenure relationships are analyzed and discussed. The labor situation is treated only in a general way in connection with phases of land tenure.

Interstate migration and county finance in California, T. V. JOHNSON and F. ARPKE (*U. S. Dept. Agr., Bur. Agr. Econ., Migration and Settlement Pacific Coast Rpt. 10* (1942), pp. [2]+50, figs. 6).—Total disbursements of county governments in California increased approximately 30 percent from 1930 to 1940, varying between individual categories from 13 percent for health and sanitation to 300 percent for charities and corrections. Growth of public expenditures is related to the increase in the number of people served and the type and quality of services extended. In Yuba County, interstate migration since 1930 accounted for 25 percent of the total 1940 population of 17,034, and was respon-

sible for public services costing \$257,513, or nearly 21 percent of a total expenditure in 1940 of \$1,244,036. In Kern County, property taxes increased \$3,029,088 between 1930 and 1940, and it is estimated that interstate migration was responsible for \$1,629,577 of this rise. In Yuba County, property taxes were actually \$17,849 less in 1940 than in 1930.

Property tax burden of Tennessee farmers, C. E. ALLRED and B. J. LUEBKE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 143 (1942), pp. IV+36, figs. 22*).—The types of taxes paid by farmers are described. The tax burden on different classes of property in the State and the equality of the property tax assessment ratios between counties, land classes, value classes, size of farm, etc., are discussed.

The percentage that taxes were of the value of farm real estate in 1939 ranged from 0.66 in Sullivan to 1.93 in Morgan County. Taxes actually paid per \$100 of real estate ranged from \$0.50 to \$4.33 for a group of 92 farms in a sample county.

Meeting wartime marketing problems (*Arkansas Sta. Bul. 428 (1942), pp. 42-45*).—Wartime marketing problems are discussed, including the marketing of fresh fruits and vegetables, peaches, canned tomatoes, and meat animals.

Efficiency of the transportation of eggs to Connecticut cooperative associations, W. J. HANSEN and R. G. BRESSLER, JR. ([*Connecticut*] *Storrs Sta. Bul. 241 (1942), pp. 35, figs. 10*).—In recent years, cooperatives have handled more than half of the eggs that go through wholesale channels in Connecticut, nearly a quarter of a million cases annually. Recommendations are made whereby, by pooling loads and in other ways it would be possible to reduce the miles traveled in transporting eggs by more than 80 percent.

Marketing and pricing chickens in Kentucky, J. B. ROBERTS (*Kentucky Sta. Bul. 433 (1942), pp. 47, figs. 19*).—This bulletin discusses the types and numbers of poultry marketed, how the prices for chickens are established and the effects of seasonal marketing on prices, the organization of marketing in country districts, the changes that have taken place in marketing methods, the relationship between volume of poultry and choice of market outlet, how dealer prices and farm prices are established, and the relationship between prices paid by different types of buyers.

Report of the Administrator of the Agricultural Marketing Administration, 1942, R. F. HENDRICKSON (*U. S. Dept. Agr., Agr. Market Admin. Rpt. 1942, pp. 83*).—The Administrator discusses the wartime marketing of farm products, lend-lease operations, domestic distribution, transportation, storage, marketing reports and statistics, standardization, inspection, marketing studies, and regulation.

Report of the President of the Commodity Credit Corporation, 1942, J. B. HURSON (*U. S. Dept. Agr., Commod. Credit Corp. Rpt., 1942, pp. 24*).—Items discussed include Food for Freedom, Ever-Normal Granary, price supports, price ceilings, and foreign purchase programs.

Seasonal variations of Indiana farm prices, E. L. BUTZ (*Indiana Sta. Bul. 469 (1942), pp. 35, figs. 34*).—Tables and charts are presented and discussed showing for the more important Indiana farm products (1) the index of average seasonal variations in prices—"the price in any given month as a percentage of the annual average price," (2) the index of irregularity—"a measure of the amount of variation from the average for a given month that may be expected in a particular year," (3) times high or low—"the number of times for each month in the period being studied that prices were high or low for the year," (4) monthly movement—"the directional movement of prices from month to month," and (5) monthly marketings—"the percentage of total annual marketings of each commodity that moved from Indiana farms and from United States farms in each

month." The prices used are those reported as of the fifteenth of each month by the U. S. D. A. Agricultural Marketing Service. The percentages of products marketed were calculated from data from the office of the State agricultural statistician of Indiana. "The 10-yr. period, 1930-39, was used wherever possible in this study. In a few cases other periods were used for comparative purposes, and in the case of cattle the period 1926-39 was used in order to cover one complete cattle cycle." The products covered by the bulletin are hogs, cattle, calves, lambs, wool, eggs, chickens, butterfat and milk, wheat, corn, soybeans, oats, hay, potatoes, and apples. The methods used in calculating the general indexes are described.

Consumption of milk and some other dairy products in metropolitan New Jersey, E. H. RINEAR (*New Jersey Sta. Bul.* 702 (1942), pp. 15, fig. 1).—A total of 1,013 usable family records were obtained in a survey in the spring of 1941 in Highland Park, New Brunswick, Newark, and the Oranges. The data are analyzed by income ranges of \$500.

It was found that the consumption of fresh milk and other dairy products is directly related to family income. The consumption of fresh milk tended to increase as income increased from \$500 to \$2,500. The proportion of evaporated milk decreased as income increased. The consumption of fresh and evaporated milk combined approached the same level in low-income families as in higher income families. The consumption of butter and cream both increased with income level. The average adult in families without children consumed more fresh milk than adults in families with children. In general, growing children in the low-income families did not consume enough milk to maintain satisfactory standards of nutrition. "When the consumers were questioned regarding the desirability of quantity discounts and larger store differentials, a large proportion of those who were in favor of these methods had incomes below \$1,500. Also, they estimated that they would increase their consumption of fresh milk more than any of the other groups." There has been a steady increase in the consumption of evaporated milk during the past 20 yr., and unless new ways of distributing fresh milk are developed that will reduce cost to consumers, dairymen supplying fresh milk for immediate consumption may find a continued decreasing demand for their product.

Maintaining quality of Oregon late-crop potatoes in retail markets, D. B. DeLoach (*Oregon Sta. Bul.* 410 (1942), pp. 7).—In cooperation with the State Department of Agriculture, a survey and sampling of 1941 crop year potatoes was made in 200 retail stores selected at random in Portland, Oreg., and the cities of the San Francisco Bay area of California. An attempt was made to determine the cause or causes for the deterioration in the quality of the potato sample below the grade established at the shipping point.

This bulletin briefly states the findings of the 1941 survey and makes comparisons with those in the first survey made in 1940 (E. S. R., 88, p. 121). Findings are discussed under the headings of deterioration caused by improper handling and merchandising, short-weight containers, size of consumer purchase as influenced by prices, and uniform sizes of potatoes in demand. Points to be considered in an educational program and rules for the care of potatoes are presented.

Trends in demand for tobaccos of the Southern States, R. S. WHITE, JR. (*Kentucky Sta. Bul.* 431 (1942), pp. 82, figs. 18).—This is a comprehensive study and description of the important factors affecting the consumption and demand for various tobaccos produced in the Southern States. World production, kinds of tobacco, and the place of tobacco in the economy of the United States are described briefly. Statistical and other data are analyzed and discussed in sections

on production, disappearance, and prices; domestic demand and consumption; tobacco exports by types and major areas of destination; some general factors affecting exports of United States tobaccos; Government policies affecting tobacco industries of foreign countries; factors affecting the foreign demand for American flue-cured tobacco, for fire-cured and dark air-cured tobacco, and for Burley and Maryland tobaccos; and tobacco exports and the present war.

RURAL SOCIOLOGY

Wartime migration from the rural Spanish-speaking villages of New Mexico, C. P. LOOMIS (*Rural Sociol.*, 7 (1942), No. 4, pp. 384-395, figs. 5; *Span. abs.*, p. 384).—Between 1939 and September 1942 there has been a decrease of almost half in the number of men and boys 15 to 65 yr. of age in 24 Spanish-speaking villages in four New Mexico counties. Some villages have lost 70 percent of their male population in these age groups. Altogether, between one-half and two-thirds of these migrants are in the armed forces, working on wartime defense projects, or engaged in reopened mines and other new work. Farmers and ranchers who customarily depend upon these people as a source of labor supply must now seek other means of getting much of their work done.

In quest of free land, A. SCHOCK (*Rural Sociol.*, 7 (1942), No. 4, pp. 431-443; *Span. abs.*, pp. 431-432).—Compulsory military service in Russia and free land in America induced many Russian-Germans to settle in the Dakota Territory. Within a few decades they had turned prairies into wheatfields and farms. The early sod huts were soon replaced by frame houses and huge barns. Their community life had all the characteristics of a pioneering group. They were a hardy folk. The church and saloon were rival institutions. Some of the early trading posts and country stores grew into small towns and villages. In their highly homogeneous life the solidarity of the family constituted the basic social unit. The home and the church played dominant roles in social control. They retained the mores of the Old World and remained unassimilated until the World War of 1914 when cultural fusion began.

A comparative analysis of the people on new ground farms, plantations, and old family farms in the upper Mississippi Delta of Louisiana, H. L. HERR (La. Expt. Sta. and U. S. D. A.). (*Rural Sociol.*, 7 (1942), No. 4, pp. 404-414, fig. 1; *Span. abs.*, p. 404).—The aim of this analysis, which is based on a sample of 660 schedules obtained in 1939, is to point out some of the similarities and differences between the recently settled new-ground families and their neighbors residing on plantations and on the long-cultivated family-size farms of the upper Mississippi Delta of Louisiana. White farmers are in a decided majority on the cut-over new ground, but in a minority on both the plantations and old family-size farms. The resultant increase of whites may exert a significant influence on local government. New-ground farms as compared with plantations attract young farmers in disproportionately large numbers. The families of these young farmers are relatively large and decidedly more often include husband, wife, and children, with and without others. The housing on the new ground as compared with that on plantations and the old family farms is most inadequate for both racial groups. The inferior material level of living of the white new-ground families is also suggested by their less frequent possession of certain material goods.

Some aspects of cultural conflict and acculturation in southern rural Brazil, E. WILLEMS (*Rural Sociol.*, 7 (1942), No. 4, pp. 375-384; *Span. abs.*, p. 375).—In Brazil there is a deep gap between the urban centers with their dependent rural areas, and the other rather self-sustaining part of the rural

population which early developed a peculiar folk culture under the impact of special environmental conditions. Besides industrialization it is chiefly foreign immigration which produces cultural clashes between highly organized immigrant groups and Brazilian rural folk. The two areas studied are the Ribeira Valley in the State of São Paulo settled by Japanese, and the Itajahi-Mirim Valley in the State of Santa Catharina settled by German immigrants. Contacts with the native rural population lead to cultural conflicts, since social values and social organization are strongly opposed in many of their major spheres. The growing industrialization process increases the social disorganization of the native workers, but disorganizes also the rural communities established by German immigrants.

At present, the Japanese community is in transition to more individualistic patterns of economic organization. Culture conflicts occur chiefly in the educational sphere. As a result, traditional controls are breaking down and the Japanese patriarchal family is giving place to a more individualized family organization.

Mistakes to be avoided in meeting labor crisis in coming year revealed by study, R. W. ROSKELLEY (*Colo. Farm Bul. [Colorado Sta.], 5 (1943), No. 1, pp. 4-5*).—The major fields in which improvements can be made are (1) more effective use of present labor supply and (2) development and perfection of ways of locating, recruiting, training, and using potential reserve labor supply.

Standard of living: An empirical test of a definition, H. R. COTTAM and A. R. MANGUS. (Pa. State Col. and Ohio Expt. Sta.). (*Rural Sociol.*, 7 (1942), No. 4, pp. 395-403; *Span. abs.*, p. 396).—This article describes an empirical test of the hypothesis that level of living, social participation, and social adjustment are components of a broader concept, standard of living.

Local leadership in rural communities of Cumberland County, Tennessee, H. J. BONSER, R. G. MILK, and C. E. ALBRED (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 144 (1942), pp. V+79, figs. 6*).—The authors conclude that in Cumberland County personalities are very often as important as issues in deciding the immediate course of an organization. In some groups the strongest leaders at times hold no office. Leaders tended to be older than the average of all people and are somewhat better educated than the adult population as a whole.

Personal influences of individuals were reported most frequently as factors helpful to these leaders in their work. Other factors prominently mentioned were literature, home training, church and Sunday school, occupational experience, special courses in school, and experience in other organizations. Of the general traits mentioned as desirable in leaders, conformity to the established modes of conduct was considered by far the most important. Other traits mentioned were identification with the group interested; honestly, faithfulness, and sincerity; and aggressiveness. Desirable traits less frequently mentioned were ability of expression, education, tact, experience, strength, good judgment, and the motive for service. Leaders who had at some time taught school offered more suggestions for developing leaders and coping with community problems than did leaders from other occupational groups. The consensus of opinion among leaders studied was that leadership has improved somewhat in this area in the last 10 years. The main reasons given for improved leadership were higher caliber school teachers and the influence of agricultural and home economics representatives in the county.

There was a positive relationship between leadership improvement in neighborhoods and such factors as number of organizations in which leaders held membership, occupational experience of leaders, education of leaders above the high

school level, attendance at conferences, type of organizations found in the neighborhood, and youthfulness of leaders.

Community organization and adult education, E. DES. BRUNNER (*Chapel Hill: Univ. N. C. Press, 1942, pp. IX+124*).—This is a report of a 5-yr. experiment in community organization and development on a county-wide scale in Greenville County, S. C.

The community church as a sociological form in New York, W. A. ANDERSON and R. WILLIAMSON. (Cornell Univ.). (*Rural Sociol.*, 7 (1942), No. 4, pp. 415-423; *Span. abs.*, p. 415).—The nondenominational community church arises as a sociological form in new areas of population concentration, in areas of insufficient population to support a denominational church, or where negligence of denominational churches occurs. The pattern of organization, though not uniform, is of the congregational type. The religious program of such a church is practically identical with those of denominational churches, and for leadership and membership these churches are dependent upon denominational sources. As denominational churches develop interdenominational cooperation through federated churches, exchange of church fields, and larger parishes, this type of church may cease to arise as a distinct form.

The challenge to democracy.—VIII, The machine and democracy, C. H. NORBY (*Iowa Sta. Bul. P28, n. ser. (1942), pp. 733-748*).—This is the final article of the series (E. S. R., 87, p. 445). The author discusses industrialism and world politics and calls attention to (1) the rise of England as the workshop of the world and (2) the opportunities and dangers of our part in international politics.

FOODS—HUMAN NUTRITION

Outlines of food technology, H. W. VON LOESECKE (*New York: Reinhold Pub. Corp., 1942, pp. 505, figs. 84*).—This book describes briefly the more important processes used in the modern food industry. As a guide to more detailed and specific information pertaining to any particular field, a list of suggested readings is appended to each chapter. Consideration is given to the tin can and the glass container, and the processes outlined pertain to the following: Fruits and their products; canning of vegetables; dairy products; meat, meat products, and poultry; fish and shellfish; grains and their products; edible fats and oils; sugars and starches; nuts; spices, relishes, essential oils, and extracts; beverages; confectionery, jams, jellies, preserves, and certified dyes; storage and marketing of fruits and vegetables; and preservation of foods by freezing.

[**Food and nutrition investigations at the Arkansas Station**] (*Arkansas Sta. Bul. 428 (1942), pp. 19-22*).—This progress report summarizes briefly the findings of studies, some of which have been noted previously, of the carotene content of peaches, by H. Reynolds and J. R. Cooper; the effect of processing on the ascorbic acid content of tomato juice, by Reynolds; the digestibility and the biological and supplemental values of rice proteins, and the thiamin content of rice and rice milling products, by M. C. Kik; and the relationship of thiamin and riboflavin deficiencies, by B. Sure.

Classification of foods, and factors for conversion of their packaging units to pounds, P. E. HOWE, C. S. PRITCHETT, and G. H. BERRYMAN (*Jour. Amer. Dietet. Assoc.*, 18 (1942), No. 7, pp. 435-448).—Tables designed for use in connection with rapid evaluation of diets are presented to show the common units in which foods are purchased, the weight of such units (converted also to the uniform basis of pounds), and certain conversion factors. In the tables the foods are arranged by classes or groups on the basis of similar nutritive content or unique contribution to the diet. The classes are as follows: Meats,

eggs, milk and milk products, fats (butter), other fats, cereals and grain products, beans and other legumes (dry), sugars and sirups, leafy green or yellow vegetables, tomatoes, citrus fruits, potatoes (Irish), other vegetables, fruits (other than citrus), dried fruits, beverages, and miscellaneous.

"It is therefore possible to obtain a rapid estimate of any diet by determining the amounts in pounds per man or 100 men per day of the various classes of foods, and then comparing these quantities with an acceptable standard. By applying weighted group averages for nutrients to these figures, an approximate quantitative estimation of the various nutrients will be obtained. Comparison and evaluation will be facilitated if stock records and lists of foods accompanying menus are classified in accordance with this plan."

Chemical composition of twenty-two common foods and comparison of analytical with calculated values of diets, F. C. HUMMEL, M. L. SHEPHERD, H. GALBRAITH, H. H. WILLIAMS, and I. G. MACY (*Jour. Nutr.*, 24 (1942), No. 1, pp. 41-56).—Average values, based on analyses of 5 (or fewer) to as many as 27 samples of each of 22 commonly used foods, are reported for the content of energy, fat, C, N, Ca, Mg, Na, K, P, Cl, S, and Fe per 100 gm. of edible portion. The determinations showed that individual samples of a given food varied from the values reported in standard tables. Na and Cl, components of extracellular fluid, varied the most widely from the values in standard tables, while K, which is an intracellular constituent, differed less from previously reported values than any other mineral constituent determined. Milk was found to be the most constant in mineral composition, but fruits and vegetables varied widely. The composition of 11 diets composited from the various foods analyzed in this study was estimated from data on the composition of these foods and was also determined by actual analysis of the composite. The composite diets as analyzed showed a more constant composition than the components, thereby emphasizing the increased accuracy which may be obtained when a large amount of a given constituent is contained in the material available for analysis. When the analyses of composite diets were compared with the dietary figures calculated from the literature there was found to be good agreement in the content of Mg, K, P, S, calories, and fat, while calculated Ca intakes were significantly higher than the determined values and Na and Cl intakes were decidedly lower. It is pointed out that for highest accuracy in dietary studies individual foods or the composite diet involved should be analyzed under the conditions of the experiment.

The food value of mushrooms (*Agaricus campestris*), E. E. ANDERSON and C. R. FELLERS. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 301-304).—Mushrooms of the commercially cultivated species *A. campestris*, examined for vitamin content by methods noted, were found to contain the following amounts per 100 gm.: Vitamin A none, thiamin 0.12 mg., riboflavin 0.52, ascorbic acid 8.60 mg., vitamin D none, vitamin E none, vitamin K + +, nicotinic acid 5.85 mg., and pantothenic acid 2.38 mg. K and P salts are reported to have been the chief constituents of the ash, with no significant amounts of Ca but with Cu and Fe present in relatively appreciable amounts. When rats received mushrooms as a sole source of protein in their diet, they survived a 6-week test period and made a gain in weight equivalent to 30 percent of that obtained by rats on a casein positive control diet.

What enriched white bread means to America, J. L. K. SNYDER (*Bakers Digest*, 16 (1942), No. 10, pp. 226-228).—This address stresses the importance of enriched bread to the consumer and the benefits accruing to the baker.

Microbiology of meats, L. B. JENSEN (*Champaign, Ill.: Garrard Press, 1942*, pp. XI+252, [pl. 1], figs. [7]).—This book deals with the industrial micro-

biology of meat foods, the academic features of bacteriology being introduced as they fit into the practical picture. The terminology is that familiar to operating men, and the presentation of data is that of practical meat operations, i. e., the flow-sheet method of times, temperatures, substrates, and number of species of organisms. The scope of the work is indicated by the chapter headings as follows: Introduction and history; some effects of sodium nitrate on bacteria in meat; gaseous fermentation in meat products by the genus *Bacillus*; bacteriology of green discolorations in meats; action of micro-organisms on fats; a study of ham souring—ante mortem and post mortem studies on the bacteriology of normal tissues of swine; microbiology of beef; bacteriology of sausage; microbiology of bacon; control of micro-organisms; bacteriology of spices, salt, sugar, paper, and wood; and a summary of food poisoning of bacterial origin. The numerous literature citations are given by footnote.

The relation of ultra-violet light and temperature during aging to quality of beef, I, J. A. McINTOSH, J. SOTOLA, M. BOGGS, J. ROBERTS, C. C. PROUTY, and M. E. ENSMINGER (*Washington Sta. Bul.* 422 (1942), pp. 26).—The effect of ultraviolet lamps on the microflora of beef was observed in tests endeavoring to speed up the aging of beef by the use of higher temperatures and humidity, these conditions being more economical and resulting in less discoloration and dehydration than the low temperatures and humidities generally used. Short loins of beef were irradiated at distances of 46 cm. for periods of 7 and 14 days, with daily rotation, at temperatures of 34°–50° F. and relative humidities of 65 and 90 percent. The irradiated loins were compared with nonirradiated loins by cutting them into steaks and subjecting them to cooking tests in which they were scored on various points. It was found that the use of ultraviolet rays of 2,537 a. u. reduced the surface microflora. Under the conditions of the experiment, however, excessive bacterial development did not occur even in the absence of ultraviolet light. Exposure of beef short loins to Sterilamps at 34°–50° for 7 and 14 days at about 90 percent r. h. darkened the color, imparted a greasy appearance to the tallow, and caused greater shrinkage (3.02–5.99 percent) than occurred in loins not exposed to the light (1.71–4.90 percent). Light treatment did not affect total cooking losses (drip and evaporation), which varied from 14.4 to 15.0 percent for steaks aged 7 and 14 days and stored 6 mo. at 0° before cooking. Aging for 7 and 14 days at 34° increased the intensity of flavor in both the light-treated and untreated series and reduced the desirability of both cover and kidney fats.

Increase in rancidity of the fats, as judged by palatability tests, occurred upon storage of the loins and steaks at 0° for 6 mo.; flavor of the lean and quantity and desirability of the juice were relatively unaffected. The ultraviolet light had no significant effect on tenderness, whereas frozen storage for 6 mo. at 0° had a slight tendering effect on good-quality beef. Vitamin D assays by the U. S. P. rat technic indicated that the beef tallow contained some vitamin D, and that the concentration was not appreciably affected by exposure of the tallow to ultraviolet light for either 10 sec. or 7 days at a distance of 46 cm.

Effect of various cooking methods upon subjective qualities and nutritive values of vegetables, E. V. S. BRINKMAN, E. G. HALLDAY, W. F. HINMAN, and R. J. HAMNER (*Food. Res.*, 7 (1942), No. 4, pp. 300–305).—The cooking utensils chosen included (1) an enamelware open kettle in which vegetables were boiled in a comparatively large quantity of water, (2) two types of aluminum "waterless" cookers permitting the cooking of vegetables in their own juices or in a very small quantity of water, and (3) a small aluminum pressure saucepan in which vegetables were cooked in steam at 15 lb. pressure.

Vegetables, including carrots, green beans, peas, asparagus, spinach, green cabbage, broccoli, cauliflower, and turnips, were cooked according to standard procedures or directions accompanying the cookers, after which they were scored and analyzed to determine the relative effectiveness of the various cooking procedures in retaining color, flavor, texture, odor, and nutritive constituents (Ca, P, and ascorbic acid) of the vegetables. The quality scores indicated that no general conclusion could be drawn that would apply to all vegetables cooked in any one type of utensil. The small pressure saucepan appeared to be as satisfactory as the open kettle for cooking carrots, turnips, and all green vegetables except asparagus, which was inferior in color and flavor when cooked in the pressure saucepan; peas thus cooked were superior in color. The pressure saucepan, however, seemed to be less desirable for cabbage, broccoli, and cauliflower. The waterless cookers produced satisfactory products only with carrots and green beans cut in strips. Calcium retentions in all methods for all vegetables ranged from 87 to 121 percent, with no one method highest in all cases; the increases in Ca occurred in beans and peas because of their absorption of Ca from the cooking water, which contained as much as 30 p. p. m. Phosphorus retentions by all methods of cooking varied from 60 to 92 percent and ascorbic acid retentions from 40 to 70 percent. Again no one method was superior for all vegetables, but on an average the pressure saucepan had a slight advantage over the other methods.

Preservation of fruits and vegetables by freezing, G. A. FILINGER. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bion. Rpt.*, 46 (1940-41), pp. 27-30).—This paper, based on unpublished data from the department of horticulture and published work from many sources, presents information on problems connected with the preservation of foods by freezing. Factors considered are suitable kinds and varieties of fruits and vegetables, containers, suitable packing methods, freezing temperatures, storage facilities, and uses of frozen products.

Chemical, histological, and palatability changes in pork during freezing and storage in the frozen state, C. L. SHREWSBURY, L. W. HORNE, W. Q. BRAUN, R. JORDAN, O. MILLIGAN, C. M. VESTAL, and N. E. WEITKAMP (*Indiana Sta. Bul.* 472 (1942), pp. 36, figs. 6).—Pork loin roasts and chops from firm and soft carcasses were frozen in a Birdseye multiple froster at -26° F. and were stored at -6.3° , -8.4° , and -8.2° for three experiments, respectively. Findings concerning the changes in the pork during freezing and during storage for periods up to 16 mo. are discussed and are summarized as follows:

"Ammonia nitrogen of the lean tissue increased to a maximum at 6 months' storage and then decreased but did not reach a value indicative of spoilage. The pH values of the lean tissue probably did not change significantly during the period of observation. Desiccation of the lean tissue due to loss of moisture was slight. Peroxides, free acidity development, refractive index, iodine values, saponification numbers, and titer values of the fatty tissue showed no important changes within the intervals studied that would indicate rancidity development or chemical decomposition of the fat during freezing and subsequent storage. Antioxidants of the fat decreased during the term of the experiments. The intensity of the factors of palatability were not affected to any important degree by freezing, or storage after freezing up to 12 or 16 mo. Desirability of flavor of fat scores showed a trend toward less desirability for storage periods of the frozen samples of 8 mo. or longer. Desirability of flavor of lean scores showed a slight downward trend with increased length of storage period.

"A highly significant correlation was found between the palatability committee scores for tenderness and the tensile strength values of the roasts as determined by the shear machine. There was no definite effect on tenderness

of roasts or chops that could be related to freezing or storage. Freezing and storage after freezing had no marked effect upon the cooking losses of the roasts and chops used in this study. Fresh muscle tissue appeared relatively normal in structure, although shrinkage in various degrees was noted and was manifest by a separation of the sarcoplasm from the endomysium. Under the conditions of freezing (-26°) both intra- and extracellular freezing damage of the tissue was observed. Tissue stored frozen for periods of 4, 8, 12, and 16 mo. appeared similar to frozen unstored tissue with respect to damage from intracellular freezing. Damage of the tissue during storage was of a progressive nature. Adipose tissue gave no evidence of damage during freezing or subsequent storage in the frozen state. The chemical, palatability, and histological studies showed that pork from firm and soft carcasses had similar keeping qualities. The combined studies demonstrate that pork frozen and stored under the conditions of these experiments was in a very satisfactory condition at the end of 1 yr. and was edible at the end of 16 mo."

Effect of fast-freezing upon bacterial flora of mackerel, J. S. KISER and T. D. BECKWITH. (Univ. Calif. et al.). (*Food Res.*, 7 (1942), No. 4, pp. 255-259).—"The bacterial flora of the muscle and intestinal contents of mackerel is reduced sharply by freezing and storage at -28° C. for 10 days. Freezing and storage for 48 hr. at -28° produced a greater decrease in numbers in suspensions of bacteria isolated from mackerel than did a similar freezing and storage period at -20° . Freezing and storage at -20° for 15 days resulted in an approximate 100-percent decrease in suspensions of *Achromobacter* sp. used, but the micrococci withstood the low temperature much better."

Home canning of fishery products, N. D. JARVIS and J. F. PUNCOCHAR (*U. S. Dept. Int., Fish and Wildlife Serv., Conserv. Bul.* 28 (1942), pp. II+31, figs. 3).—This bulletin, superseding Investigational Report No. 34, revised (E. S. R., 86, p. 414), presents detailed information to assist homemakers to can difficult fishery products safely and economically. Consideration is given to the principles involved in canning sea foods, to equipment requirements, canning procedure, and recommended canning methods for specific fish and shellfish. Certain fishery products unsuitable for canning are noted, and a word of caution is given concerning tasting for suspected spoilage.

Dehydration of foods in war-time, W. V. CRUESS. (Calif. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 22 (1942), No. 4, pp. 105-107, 118, fig. 1).—This paper considers very briefly the advantages of dehydration, the need for dehydrated foods, and certain principles and problems involved in dehydration. A number of agencies now carrying on research on dehydration problems are noted.

Texas begins dehydrated food research, S. H. YARNELL. (Tex. Expt. Sta.). (*Canner*, 96 (1943), No. 6, pp. 54-55).—This is a brief statement of the scope of work being done by the station on the dehydration of Texas-grown vegetables. Preliminary drying tests with cabbage, carrots, potatoes, mustard greens, onions, snap beans, and spinach indicated that attractive products of good quality can be obtained. Beets and rutabagas are also to be tested. The products are being tested not only for quality but for vitamin content as well.

Preserving nutritive value in drying food is goal of project; dehydrator plan given, W. E. PYKE and R. BARMINGTON (*Colo. Farm Bul. [Colorado Sta.]*, 4 (1942), No. 4, pp. 10-11, figs. 2).—The compact highly satisfactory dehydrator built at the station is of the tunnel type modified to fit into a portable cabinet and equipped with a gas heater of the direct radiation type. Cherries, potatoes, corn, beans, peppers, beets, and carrots have been satisfactorily dehydrated, and carotene analyses of the carrots showed that the dehydrated product contained

less than 2,500 $\mu\text{g.}$ of carotene per gram, in comparison with 25 $\mu\text{g.}$ per gram in the fresh carrots.

Dehydration of olives, W. V. CRUESS and H. F. FRIAR. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 22 (1942), No. 4, pp. 116, 124).—On the basis of certain recent investigations, it is recommended tentatively that dead ripe Mission and Manzanillo olives be treated one-half to three-fourths to the pit with lye, rinsed in water, soaked in brine, and dehydrated to less than 10 percent moisture. The aim is to give a product which can be reconstituted quickly in boiling water to give a relish, or which can be used directly in cookery as a flavoring.

Dried vegetables are made into "bricks" freed from air in new packaging process to insure color, flavor, and nutritive value (*Farm Res. [New York State Sta.],* 9 (1943), No. 1, p. 17).—Dried carrots, beets, cabbage, sauerkraut, and other products are subjected to tremendous pressure to reduce the materials to small bricks practically free from air. The effectiveness of various packaging materials in protecting these bricks against spoilage under such simulations of tropical conditions as holding the packages in tanks of water or storing them at a temperature of 100° F. and at a humidity of 85 percent is being tested bacteriologically, by determining loss of vitamin content, and by other means. The gasproofing qualities of the packaging materials are also being studied.

An analytical study of cucumbers and cucumber pickles, L. J. CAMILLO, C. A. HOPPERT, and F. W. FABIAN. (Mich. Expt. Sta.). (*Food Res.*, 7 (1942), No. 5, pp. 339–352; *abs. in Mich. Sta. Quart. Bul.*, 25 (1943), No. 3, pp. 272–273).—Determinations of proximate constituents, minerals (Ca, P, Fe, and Cu), and vitamins (A, thiamin, riboflavin, ascorbic acid, and D) were made by methods noted in fresh cucumbers and various types of pickles made from them by commercial processes. Total solids in all varieties of pickles were higher than in the cucumbers from which they were made, this increase being particularly pronounced in sweet pickles and bread-and-butter pickles, due to materials added in the course of manufacture. Protein, Ca, and P values for pickles showed a decrease as compared with the fresh cucumbers, and in the fermented pickles (genuine dill and salt-stock pickles) reducing sugars were removed during the first 4 days of fermentation. The carotene content of pickles, as determined by the method of Peterson et al. (*E. S. R.*, 85, p. 583) or of Petering et al. (*E. S. R.*, 83, p. 438), was higher than in the fresh cucumbers in which values calculated to International Units ranged from 166 to 290 per 100 gm.; the increase in values ranged from 23 percent in pasteurized dill pickles to 261 percent in salt-stock pickles. In the fresh cucumbers, ascorbic acid, expressed as International Units per 100 gm., ranged from 234 to 293, and the amounts of thiamin and riboflavin were low. The amounts of these water-soluble vitamins decreased in the pickles, the decrease amounting to from 33 to 87 percent in dill pickles, from 12.5 to 40 percent in pasteurized dill or bread-and-butter pickles, and from 75 to 86 percent in salt-stock pickles. A determination of the biological value of the carotene fraction extracted from a sample of spiced pickles indicated a value of 80 percent of the color value expressed as β -carotene. The carotene content of the various kinds of commercial pickles obtained from manufacturers from different parts of the country varied from 20.4 to 103.2 $\mu\text{g.}$ per 100 gm. (27.2–137.6 I. U.), while the ascorbic acid, determined by the method of Moore and Ely (*E. S. R.*, 86, p. 586), ranged from 62 to 236 I. U. per 100 gm.

The fate of enzymes in processed foods, A. K. BAILS. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 22 (1942), No. 2, pp. 36–39).—This paper presents some of the useful information available on the fate in food processing of enzymes responsible for deterioration and decay. Gas storage, low-tempera-

ture storage, drying and heat, or combinations of these, destroy enzymes. In practice, therefore, tissues must be blanched. The blanching must be relatively thorough, or else subsequent storage must be relatively cold or very dry. Heating, in this case blanching, inactivates the enzyme through action on its protein component, which is denatured by the heat. This denaturation is not always permanent, and the protein may revert on cooling to its native state; this occurs especially if the heating is brief, followed by rapid cooling and storage in a medium of favorable pH. To prevent this protein reversion, i. e., to prevent enzymes from reappearing later on, the blanching must be done for a sufficient length of time, since long heating is more destructive of the enzyme proteins than brief high temperatures. Experience with blanched products in food industries indicates that certain enzymes of this group are capable of causing discoloration and off-flavors. The substances responsible for these effects are often intermediate products formed in the course of a series of enzyme reactions; when the chain of reactions is interrupted by destruction of one of the enzymes, the intermediate product may accumulate rather than CO_2 or H_2O , the end products of the reaction. In food processing it is desirable to test for the survival of typical enzymes. The indicator enzyme chosen must lend itself to easy testing, must not be too easily destroyed by heat, and should be known to recover some of its activity on cooling; the test should be roughly quantitative to enable setting up a graded scale of enzyme inactivation. Phosphatase for milk and peroxidase for some fruits and most vegetables are enzymes meeting these conditions. Total destruction of the enzymes in a food is usually not practical or necessary, but subsequent storage conditions must be at temperatures and humidities low enough to slow down the residual enzyme action to the point where the product keeps satisfactorily.

Better food for our children, A. F. MORGAN (*Hygeia* [Chicago], 20 (1942), No. 11, pp. 848, 871).—This article indicates briefly some of the steps that have been taken toward improvement of the nutrition of pupils through the school lunch program and estimation of nutritional status in the course of physical examination, and suggests that the educational attack on the problem is through the schools with the educational process including not only the pupils but also parents, teachers, doctors, nurses, dentists, principals, and school boards.

Nutrition and chemical growth in childhood.—I, Evaluation, I. G. MACY (*Springfield, Ill.: Charles C. Thomas, 1942, vol. 1, pp. XXIV+432, figs. [67]*).—The work of the author and her associates, conducted over a period of 20 yr. in connection with investigations of the processes of human growth and maintenance, are assembled from many published sources and evaluated for presentation in this monograph. A second volume, Interpretation, is projected. The organization of material is indicated by the chapter headings as follows: General considerations in metabolic balance studies, organization of an extensive metabolic investigation, satisfying appetite and meeting recommended dietary allowances, some physiological aspects of digestion and excretion, some chemical aspects of digestion and excretion, energy metabolism in childhood, metabolic balances, hematochemical studies, and methods.

The earlier investigations dealt with the phenomena of the reproductive cycle, the mineral metabolism of mothers during various stages of pregnancy and lactation, and the composition and secretion of human milk. The metabolism of normal women was also studied. The more recent work, dealing with nutrition and chemical growth in childhood, included study of the intake and excretion of 18 chemical substances by normal children, supplemented with pediatric, anatomic, psychometric, physiologic, anthropometric, roentgenologic, and chemi-

cal observations. Techniques for efficient and economical conduct of investigations of human subjects, accurate chemical and physicochemical methods, simple reliable methods of recording voluminous data, and improved methods available for handling and interpreting the values obtained by experimental procedures were developed in the course of the investigations.

Dietetics for the clinician. M. A. BRIDGES (*Philadelphia: Lea & Febiger, [1941], 4. ed., rev., pp. 960, [figs. 6].*).—In the present edition (*E. S. R., 70, p. 868*) revisions in the first part, which deals with general information, include the introduction of a lengthy discussion of acid-base factors in nutrition, and an extensive change in the vitamin section, which presents an account of certain historically significant developments; a practical working basis of this phase of nutrition; and a glossary of vitamin terms giving condensed information. In the second part, dealing with the dietary management of diseases, one of the most conspicuous changes is the substitution of typical diets for the sample menus heretofore used. These typical diets are all based on the standard normal from which they deviate as little as possible. Part 3, pediatrics, has been omitted from the present edition. Some material on the management of diseases of children, but none on normal infant feeding, is included in part 2.

Calcium, phosphorus, and nitrogen metabolism of young college women. H. MCKAY, M. B. PATTON, M. A. OHLSON, M. S. PITTMAN, R. M. LEVERTON, A. G. MARSH, G. STEARNS, and G. COX. (Ohio, Nebr., Iowa, Kans., and N. C. Expt. Stas. et al.). (*Jour. Nutr., 24 (1942), No. 4, pp. 367-384, figs. 3.*).—This report, presented as paper No. 15 of the regional project of the North Central States relating to the nutritional status of college women, deals with Ca, P, and N intakes and retentions of (1) 124 college women from four States (Ohio, Nebraska, Iowa, and Kansas) on their customary self-chosen diets; (2) an individual for forty-four 5-day periods at intervals during her nineteenth through her twenty-second year; and (3) a group of 9 young women eating controlled basal diets supplemented daily with 1, 2, or 3 cups of milk, respectively. The results showed that place, age, and weight differences were not significant for the 124 subjects, and that intake was significantly related to retention. Mean daily retention varied among individuals on similar intakes. Figures of regression of balance upon intake showed that mean daily intakes of 0.8 gm. Ca, 1 gm. P, and 9 gm. N, respectively, were required for equilibrium in the groups of 124 and 9 subjects. With intakes of Ca less than 0.8 gm., only 43 percent of those on self-chosen diets showed a storage of this element as compared with 70 percent of those on the controlled diet; similarly, at Ca intakes above 0.8 gm., 70 and 82 percent of these two groups stored Ca, with corresponding retentions of 0.055 and 0.070 gm. This superior retention associated with type of diet (self-chosen v. controlled with milk supplement) was also evidenced to some extent in the case of P retention. There was no evidence of better utilization of N by those on controlled diets than by those on the self-chosen diets. The one subject studied intensively required 1.1 gm. Ca, 1 gm. P, and 8 gm. N for equilibrium, these amounts being higher than the mean figures for the group average.

The response of the young women in these several groups suggests the desirability of a generous Ca allowance; the 1-gm. allowance recommended by the Committee on Food and Nutrition of the National Research Council for girls of from 16 to 20 yr. is considered desirable for this older age group of from 17 to 24 yr. Since the Ca, P, and N retention relationship for the large group was similar to the relationship commonly accepted whereas that for the single individual was not, it is considered that a short-time study of a large group is

more desirable than the intensive study of one individual in estimating population needs.

Length of the observation period as a factor in variability in calcium retentions. H. MCKAY, M. B. PATTON, G. COX, M. A. OHLSON, M. S. PITTMAN, R. M. LEVERTON, A. G. MARSH, and G. STEARNS. (Ohio, Nebr., Iowa, Kans., and N. C. Stas. et al.). (*Jour. Home Econ.*, 34 (1942), No. 9, pp. 679-681).—This report, based on the data obtained in the study noted above, is listed as paper No. 14 of the regional project noted above. The Ca intake and retention data of the young college women on their customary self-chosen diets were studied for variance due to differences in length of observation period. An analysis of variance and covariance was made by the method of Snedecor, and the mean square of retention, when adjusted by means of regression to a mean intake, was used as the measure of variance. The F test was used to determine significance of differences in mean squares. For 109 of the individuals, for whom there were 180 studies, the variance was significantly less in either 7- or 10-day observation periods than in the 5-day periods. The difference between the 7- and 10-day periods was not significant, so that of the three periods the 7-day period is considered the most practical.

The mechanism of the effect of calcium salts on the succinoxidase system. K. F. SWINGLE, A. E. AXELROD, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 145 (1942), No. 2, pp. 581-591).—Evidence is presented in support of the hypothesis that "calcium stimulates the succinoxidase system by activating the cozymase nucleotidase present in the tissue so that cozymase is destroyed and cannot function in the dehydrogenation of malate to oxalacetate, which is strongly inhibitory to the succinoxidase system."

Trace elements in foods. H. O. CALVERY (*Food Res.*, 7 (1942), No. 4, pp. 313-331).—This address before the American Public Health Association in October 1941 is based on a review of the literature and is concerned with the occurrence, nutritional value, and toxicity of a number of elements occurring in small quantities in foods. These included the nutritive trace elements Co, Cu, Fe, I, Mn, and Zn; nonnutritive, nontoxic trace elements, Al, Be, B, Cr, Si, Sr, Sn, Ti, and Ni; and nonnutritive, toxic trace elements, Ag, Bi, Cd, F, Hg, Pb, As, Sb, Ba, Br, Se, Te, Mo, V, and Tl. It is pointed out that Cs, Ce, Ge, Au, La, Li, Rb, Th, and Zr have been reported present, but sufficient quantitative data are not available, their nutritional significance is not established, and their toxicology has not been thoroughly investigated. It is also noted that although physiological significance has been ascribed to As, Al, Ba, Br, F, Ni, Rb, and Si, entirely satisfactory demonstration of their essential nature to higher animals has not yet been accomplished except possibly in the case of F.

Molybdenum in the nutrition of the rat. J. D. TERESI, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 137 (1942), No. 3, pp. 504-508).—The Mo determination carried out on the ashed samples involved the extraction of the orange thiocyanate complex with ether under conditions for maximum color development, followed by color measurement in an Evelyn colorimeter, making use of a special 470 m μ filter. Samples of cow's milk averaged 47.5 μ g. of Mo per liter (range 40-58 μ g.), while goat's milk averaged only 13.5 μ g. (range 11-16 μ g.). The Mo content of the body of rats was found to be low when the rats were fed goat's milk alone; when this milk was supplemented with Mo (as sodium molybdate) there was some increase in the rat content of this element, but the increase was so slight as to indicate very poor absorption of Mo by the rat. "About 0.5 μ g. of Mo per day was taken in by a growing rat on a basal ration of goat's milk mineralized with Cu, Fe, and Mn. Since supplementing this ration with Mo did not accelerate the growth rate, it

can be concluded that if Mo is needed by the growing rat, then 0.5 μ g. per day satisfies this requirement."

The influence of aluminum sulfate and aluminum hydroxide upon the absorption of dietary phosphorus by the rat, H. R. STREET (*Jour. Nutr.*, 24 (1942), No. 2, pp. 111-119).—The experiments described were designed to study the influence of aluminum on the utilization of phosphorus in growing rats as evidenced by their growth on a synthetic basal diet low in phosphorus (0.035-0.042 percent) but otherwise adequate, and variously supplemented with phosphate or with both phosphate and aluminum sulfate or hydroxide in definite atomic proportions of aluminum to phosphorus. When the aluminum was in the soluble form as aluminum sulfate and was fed in amounts chemically equivalent to the phosphorus in the ration, there was almost complete failure of growth, indicating that most of the phosphorus in the ration was rendered unavailable. Increasing the phosphorus to 0.60 percent so that the atomic ratio to aluminum was 5:2 permitted optimum growth, however, as judged by comparison with the growth responses of control rats receiving this level of phosphorus and no aluminum. On the other hand, when aluminum hydroxide was fed at levels representing 1:1, 2:3, or 2:1 atomic ratios with phosphorus, the growth response of these groups as compared with that of others on comparable phosphorus levels but without aluminum suggested that only one-third to one-fourth of the aluminum was converted to a form reacting with phosphorus.

The effect of sulfaguanidine on rat growth and plasma prothrombin, S. BLACK, R. S. OVERMAN, C. A. ELVEHJEM, and K. P. LINK. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 145 (1942), No. 1, pp. 137-143).—Sulfaguanidine, an effective bacteriostatic agent for intestinal organisms, was used in a purified synthetic ration found adequate for growth and maintenance of a normal blood picture in rats. The sulfaguanidine reduced the growth rate of the young rats, and this effect was accompanied by a state of hypoprothrombinemia as measured by the prothrombin time of a diluted blood plasma. The latter effect of the sulfaguanidine was attributed to its inhibition of synthesis of vitamin K by the intestinal flora of the rat. *p*-Aminobenzoic acid and a distinct factor in liver extract (found in a norite eluate fraction) counteracted both effects of sulfaguanidine. Vitamin K counteracted the prothrombin effect only. The mechanism of action of sulfaguanidine and its antagonists in the rat is discussed, and the possible bearing of these findings on sulfonamide therapy is indicated.

Studies on hemorrhagic anemia in dogs, J. M. McKIBBIN, A. E. SCHAEFER, C. A. ELVEHJEM, and E. B. HART. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem.*, 145 (1942), No. 1, pp. 107-122, fig. 1).—Adult dogs on a whole milk ration were rendered anemic by severe bleeding and were then observed for their blood regeneration response under the influence of various additions to the ration. They failed to respond to Fe and Cu when high levels of Co were added to the whole milk, but rapid regeneration occurred when this ration was further supplemented with whole dried liver or liver extracts. The activity of the liver was not wholly replaced by synthetic B vitamins, bile salts, cysteine, uropterin concentrates, and high levels of ferrous Fe when fed individually, but blood regeneration comparable to that produced by liver preparations was observed when the above supplements were fed together. Dogs receiving a highly purified ration (consisting of sucrose, casein, cottonseed oil, cod-liver oil, and a salt mixture), supplemented only with synthetic vitamins (thiamin, riboflavin, nicotinic acid, pyridoxin, pantothenic acid, and choline), retained their ability to regenerate a normal blood stream after severe bleeding for many months. This regeneration was complete in 2 weeks.

Recent advances in our knowledge of the vitamins, C. A. ELVEHJEM. (*Univ. Wis.*). (*Sci. Mo.*, 56 (1943), No. 2, pp. 99-104).—A brief survey.

Vitamin, protein, calcium, iron, and calorie yield of vegetables per acre and per acre man-hour, J. H. MACGILLIVRAY, C. G. HANNA, and P. A. MINGES. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 293-297).—Essentially noted from another source (E. S. R., 88, p. 546).

The carotene content of sweet potatoes, H. L. COCHRAN. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 259-264).—This review article quotes data from the sources cited, and considers such phases as the effect of storage and of breeding on the carotene content and the stability of carotene and vitamin A in sweetpotatoes.

Über eine neue Quelle des Karotins (Provitamin A) [A new source of carotene], L. J. GOMOLJAKO (*Compt. Rend. (Dok.) Acad. Sci. U. S. S. R.*, n. ser., 32 (1941), No. 2, pp. 142-143).—Fruits of the golden currant (*Ribes aureum*), as grown in various European botanical gardens and including two seedlings grown from seed obtained from North America, were studied for their suitability as food and their chemical composition. Of the 15 samples investigated, 9 appeared satisfactory from the standpoint of flavor and odor, and these upon analysis gave the following range of values: Dry matter, 14.2-23.0 percent; ascorbic acid, 32.5-58.4 mg. percent; carotene 1.8-5.2 mg. percent; sugar, 5.5-12.9 percent; and acidity as malic, 0.9-1.5 percent. Corresponding values for a single sample of wild fruit, *R. aureum* [*diacanthum*] were 18.0, 21.1, 0.6, 12.0, and 1.1.

The mobilization by alcohols of vitamin A from its stores in the tissues, S. W. CLAUSEN, W. S. BAUM, A. B. MCCOORD, J. O. RYDEEN, and B. B. BREESE (*Jour. Nutr.*, 24 (1942), No. 1, pp. 1-14).—Earlier work on the mobilization of vitamin A from its stores in the tissues of dogs by ethyl alcohol (E. S. R., 84, p. 702) has been extended to methyl, propyl, and isopropyl alcohols with similar results, there being in all cases a marked increase in the vitamin A concentration in the blood serum whatever the mode of administration of the alcohol. The effect was attributed to the mobilization of the vitamin from its storage places, such as the liver and fat depots, rather than to increased absorption from the gastrointestinal tract. Nearly all of the mobilized vitamin A and the greater part of the vitamin in the tissues was found to be in the form of the ester but with a small portion of the free vitamin. It is suggested that vitamin A must be in the free form to be utilized by the tissues, but that it is stored as the ester.

Tocopherol and the stability of carotene, F. W. QUACKENBUSH, R. P. COX, and H. STEENROCK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 145 (1942), No. 1, pp. 169-177).—Carotene supplements of 5 μ g. per day, fed in ethyl linolate, failed to produce growth in young rats deficient in vitamin A, but when fed in soybean oil or in the distillate obtained by molecular distillation of this oil growth resulted. The protective factor was apparently tocopherol, since equivalent amounts of synthetic α -tocopherol and soybean tocopherol produced a similar response. α -Tocopherol was effective at concentrations of 0.01-0.03 percent (2-6 μ g. daily). Vitamin K₁, pyrogallol, catechol, and hydroquinone, also tested as substances that would inhibit the oxidative destruction of carotene, failed to promote growth when added at a level of 0.02 percent. Hydroquinone, however, gave a good response at 1 percent. α -Tocopherol and hydroquinone, when tested in vitro, were equally effective antioxidants for carotene in linolate. Water extraction of the carotene-linolate solutions containing hydroquinone or tocopherol destroyed the effectiveness of hydroquinone but not of tocopherol. It is suggested that the low protective power of hydroquinone in the animal tests was probably due to its extraction from the lipid phase in the gastrointestinal tract. Hydroquinone was found to stabilize the tocopherol as well as the carotene in vitro, thus sparing the tocopherol for the protection of carotene in the tract. It is considered, in the light of these tests, that the problem

of instability of carotene in oil solutions exposed to oxygen can be solved by the use of lipophilic antioxidants such as tocopherols.

The effect of dehydration upon the vitamin A content of eggs, S. M. HAUGE and F. P. ZSCHEILE. (Ind. Expt. Sta.). (*Science*, 96 (1942), No. 2502, p. 536).—Paired lots of fresh, homogenized, liquid eggs and dried eggs collected at a commercial plant which employed a Mojonner spray drier were saponified and extracted with ether and then subjected to spectroscopic examination. Determinations of absorption, made at 3,240 a. u. to indicate changes in vitamin A and at 4,370 a. u. to indicate changes in total carotenoid content, gave characteristic absorption curves of the fresh and dried eggs that were identical in the visible region and very similar in the ultraviolet. The drying process caused losses of carotenoid and vitamin A that were comparable to sampling errors and amounted to about 2 and 5 percent, respectively. Losses during storage of both liquid and dried eggs at -18°C . for 14 weeks were no greater than those caused by drying. Biological assays of the homogenized and the dried eggs showed that little or no deterioration of the vitamin A took place in the dehydration, and that the samples on a moisture-free basis had vitamin A potencies of about 44 International Units per gram.

Vitamin B complex content of beers, ales, and malt tonics, S. LAUFER, R. SCHWARZ, and L. LAUFER (*Food Res.*, 7 (1942), No. 4, pp. 306-308).—Three different brands of beer, three of ale, and three of malt tonic, assayed by microbiological methods for various members of the B complex, were found to contain, respectively, per 100 cc. 1.47-4.02 (average 2.7), 1.11-8.19 (4.1), and 0.00-48.60 (18.6) μg . of thiamin; 22.7-33.0 (average 27.0), 30.4-38.0 (33.5), and 38.7-57.3 (48.4) μg . of riboflavin; 0.783-0.868 (average 0.817), 0.694-0.891 (0.817), and 1.040-1.790 (1.49) mg. of nicotinic acid; and 85-120 (average 102), 90-100 (94), and 100-133 (121) μg . of pantothenic acid. The low thiamin content is considered as probably due to absorption of thiamin by the yeast in the course of fermentation.

Studies on the succinoxidase system of rat liver in riboflavin deficiency, A. E. AXELROD, K. F. SWINGLE, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 145 (1942), No. 1, pp. 297-307).—Determinations of succinoxidase in rat livers, by the modified method of Axelrod et al. with and without the addition of Al as AlCl_3 to the flask, indicated that Al had no effect on the succinoxidase system either in the presence or absence of added Ca. Analyses of various components of the succinoxidase system of rat liver in riboflavin deficiency showed that the cytochrome oxidase component was present in large excess. Al and cytochrome oxidase were thus eliminated as factors of the succinoxidase system which might be affected in riboflavin deficiency and thus complicate the assay for succinic dehydrogenase. Cytochrome c and the enzyme systems involved in the destruction of coenzyme I were not diminished in riboflavin deficiency. The succinoxidase activity of rat livers per unit of dry weight, as measured by O_2 consumption for the complete succinoxidase system, were increased in chronic starvation, while the total succinoxidase activity of the total liver was not affected. The succinoxidase activity of the rat liver was not diminished in biotin and pantothenic acid deficiency. The data presented in this and a previous experiment (E. S. R., 87, p. 894) indicated that one or more components of the succinoxidase system other than cytochrome c, cytochrome oxidase, Ca, or Al are diminished in riboflavin deficiency, and it was deduced from these results that the component or components affected in the riboflavin deficiency were flavoproteins.

The thiamine and riboflavin contents of citrus fruits, M. I. BAILEY and A. W. THOMAS (*Jour. Nutr.*, 24 (1942), No. 1, pp. 85-92).—The fruit samples

analyzed in this study were Florida-grown and represented one-fifth of the number of fruit in the standard box as purchased in New York City during the season of 1939-40. Analyses were carried out on the juice, expressed by pressure rather than by reaming and clarified by sedimentation. Thiamin was determined on the enzyme- (takadiastase) treated juice by a modification of the Hennessy and Cerecedo method (E. S. R., 82, p. 588). "In short, the thiamin was adsorbed on permutite, eluted with acidified potassium chloride solution, and oxidized to thiochrome by means of alkaline ferrieyanide solution. The thiochrome was extracted from the alkaline aqueous solution by isobutanol, and the intensity of its fluorescence measured in a Pfaltz and Bauer fluorophotometer, with prescribed 'blank' correction." Riboflavin was determined on the clear (filtered following sedimentation) juice by direct fluorometric measurement made on (1) the filtered juice, (2) the same with riboflavin additions (0.05 or 0.075 μg per cubic centimeter), and (3) any two of the above treated with hydrosulfite for blank correction. From the several readings, the riboflavin content of the juice was calculated. The average values, expressed as micrograms per 100 cc. of juice, were obtained as follows for the thiamin and riboflavin contents, respectively: Pineapple oranges, 65 and 16; Valencia oranges, 70 and 15; seeded grapefruit, 35 and 12; seedless grapefruit, 32 and 11; tangerines, 69 (thiamin only). Based on the average juice volume of the particular specimens, the thiamin chloride hydrochloride content, expressed as micrograms per fruit, averaged 80, 91, 85, 81, and 45 for Pineapple and Valencia oranges, seeded and seedless grapefruit, and tangerines, respectively; the riboflavin per fruit was 20 μg . per orange and 27 μg . per grapefruit. The fruit sizes, designated as the number of individual fruits to just fill a standard Florida box, were 176, 70, and 150 for the oranges, grapefruit, and tangerines, respectively.

The thiamin, riboflavin, nicotinic acid, and pantothenic acid contents of wild rice (*Zizania aquatica*), J. W. NELSON and L. S. PALMER. (Minn. Expt. Sta.). (*Cereal Chem.*, 19 (1942), No. 5, pp. 539-540).—The five samples of wild rice were of the native crop harvested by the Indians of Minnesota and were representative of the parched product processed and marketed by the Indians. The vitamin values, determined by methods noted, gave the following averages expressed as milligrams per 100 gm.: Thiamin 0.470, riboflavin 0.633, nicotinic acid 6.13, and pantothenic acid 1.01. These results indicate that parched wild rice may be regarded as a good source of these vitamins in human nutrition.

The thiamin content of wheat flour milled by the stone milling process, A. S. SCHULTZ, L. ATKIN, and C. N. FREY (*Cereal Chem.*, 19 (1942), No. 4, pp. 529-531).—White flours produced at the present time in two stone mills operating in the manner of the past century were assayed for thiamin content by the fermentation method modified to embody sulfite cleavage (E. S. R., 88, p. 293). Flours of the three millings, representing 54, 55, and 62 percent extraction, respectively, contained in this order 4.04, 4.74, and 4.52 μg . of thiamin per gram as compared with 5.2, 4.67, and 5.6 μg . per gram in the respective wheats; values for the respective brans were 5.82, 9.8, and 9.18 μg . and for the middlings 6.27, 4.46, and 6.0 μg . per gram. These stone-ground white flours contained, therefore, a concentration of thiamin roughly equivalent to that in the whole grain, and the offal or feed byproducts equaled or somewhat exceeded the flour in thiamin concentration.

The stability of vitamin B₁ in the manufacture of bread, A. S. SCHULTZ, L. ATKIN, and C. N. FREY (*Cereal Chem.*, 19 (1942), No. 4, pp. 532-538).—Thiamin was determined, by the yeast fermentation method which included the

sulfite modification (E. S. R., 88, p. 293), in the dough batch after mixing and in the finished breads prepared as laboratory bakes based on the straight dough process. From each batch of dough, two loaves were baked at 410° F. for each of the following periods: 10, 20, 30, and 40 min. One loaf of each pair was prepared for total thiamin analysis, while the other was separated into crust, innermost crumb, and intermediate portion, each of which was analyzed separately. The investigation was carried out with enriched white bread made with a commercial enriching concentrate containing synthetic thiamin, a whole-wheat bread, and an enriched white bread made with high vitamin B₁ yeast. Determinations were also made on the dough and baked loaves of the three types of bread prepared and baked under normal commercial bakery conditions. The results of this study showed that there was a progressive decrease of thiamin as the time of baking increased, the destruction amounting to 3, 13, 21, and 33 percent in the increasing baking intervals employed; the loss in the well-baked loaf (30 min.) compared favorably with the 21-26 percent losses noted in the commercially baked loaves. The stability of the thiamin in baking was not affected by the source of the thiamin. The major part of the thiamin destruction occurred in the crust, in which the thiamin content was reduced by 50 percent as the time of baking was extended from 10 to 40 min.; in the same time the crumb lost only 17 percent of its thiamin. Results from the large-scale bakery experiments agreed with the laboratory results. The sulfite blank, which reflected the presence of interfering aminopyrimidine fermentation activity, was found to increase as thiamin was inactivated by increased baking time. This indicated that a portion of the thiamin was split as it was inactivated. The increase in sulfite blank was not equivalent to the thiamin destroyed, but equaled only 29 percent in the 40-min. bake.

The effect of sodium bicarbonate on the thiamine content of peas, H. J. DEUEL, JR., C. JOHNSTON, L. SCHAUER, and S. RAPAPORT (*Science*, 97 (1943), No. 2506, pp. 50-51).—Cooking tests were applied to fresh and frozen peas, the latter including those prepared by tunnel freezing (I) and others by plate freezing (II). In all tests 85 gm. of peas were cooked with 180 cc. of water; in sodium bicarbonate tests 0.22 gm. of NaHCO₃ was added. Thiamin determinations by the fermentation and bio-assay procedures indicated thiamin contents of 333, 408, and 351 µg. per 100 gm. of fresh peas and frozen peas I and II, respectively. These samples, when cooked in water 17, 6, and 6 min., respectively, retained per 100 gm. of fresh peas a total of 336, 416, and 340 µg. of thiamin (in peas and cooking water); soda reduced the cooking times to 8, 4, and 4 min., respectively, and gave thiamin retentions of 321, 374, and 218 µg. The greater loss of thiamin in type II of the frozen peas is attributed to the partial mashing of the peas by the method of freezing. Fresh peas (of another series) which were overcooked to the extent of rupture of the hulls averaged 35 and 57 percent of the original thiamin upon cooking in water, and in water and sodium bicarbonate, respectively. "The experiments indicate that no greater destruction occurs in the thiamin remaining in the intact pea after cooking with sodium bicarbonate than when water alone is employed. Slightly greater destruction results in the thiamin leached out of the pea during cooking. The loss only amounts to 8.3 percent in the frozen peas and 3.6 percent in the fresh peas cooked with sodium bicarbonate."

The nicotinic acid content of meat, W. J. DANN and P. HANDLER (*Jour. Nutr.*, 24 (1942), No. 2, pp. 153-158).—Data are reported on the nicotinic acid content of various cuts of meat purchased in local retail stores. The analyses were made by the chemical procedure of the authors (E. S. R., 87, p. 14), using completely decolorized digests of the tissue. Most of the cuts showed considerable variation from one sample to another, but there was no evidence that the various meats differed in nicotinic acid content. Thus, nicotinic acid, expressed

in micrograms per gram fresh weight, varied from 40 to 82 $\mu\text{g.}$ in beef muscle meats, from 54 to 102 $\mu\text{g.}$ in lamb muscle, from 49 to 91 $\mu\text{g.}$ in veal muscle, and from 61 to 80 $\mu\text{g.}$ in chicken leg muscle; the chicken breast muscle, however, was much richer, containing from 110 to 181 $\mu\text{g.}$ per gram. Kidney and liver were richer than the muscle meats in nicotinic acid, values obtained for these organs (from beef, pork, and veal) varying, respectively, from 65 to 100 and from 76 to 166 $\mu\text{g.}$ per gram fresh basis; chicken liver was equally rich, the samples analyzed varying from 114 to 178 $\mu\text{g.}$ per gram. It is pointed out that the values reported are considerably lower than those obtained by Walsman et al. (E. S. R., 84, p. 563), employing bio-assay with the dog, and by McIntire et al. (E. S. R., 87, p. 150), using a chemical procedure with only partially decolorized digests, but that they corresponded more closely with results obtained by Walsman and Elvehjem (E. S. R., 86, p. 560) in microbiological assay and are believed to be more nearly correct. The effect of cooking was examined, using several types of meat; in general, from one-third to one-half of the nicotinic acid was lost, as calculated on the basis of the dry weight of the meat.

The metabolism of pyruvate by liver from pantothenic acid- and biotin-deficient rats, F. J. PILGRIM, A. E. AXELROD, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 145 (1942), No. 1, pp. 237-240).—The livers, homogenized in ice-cold Ringer-phosphate buffer solution, were permitted to act on the sodium salts of pyruvic, fumaric, and *l* (+)-lactic acids under specified conditions. Data on O_2 consumption per milligram of dry weight of tissue per hour in the presence of the substrate, less the endogenous consumption, showed that there was a decreased rate of pyruvate oxidation in liver from the pantothenic acid- and biotin-deficient rats. These results are interpreted to indicate indirectly that these vitamins may be components of the enzyme systems concerned with the metabolism of pyruvate.

Storage of pyridoxine in the rat, L. R. CERECEDO and J. R. FOX (*Jour. Nutr.*, 24 (1942), No. 1, pp. 93-96).—Evidence along three lines is presented indicating that rats are capable of storing pyridoxin—(1) litters of rats of varying ages, which had been maintained on a satisfactory diet in which the B vitamins were furnished by 10 $\mu\text{g.}$ of thiamin chloride, 20 $\mu\text{g.}$ of riboflavin, and 0.3 cc. of a fuller's earth filtrate of pig liver extract equivalent to 3 gm. of fresh liver, were placed on a pyridoxin-free diet; (2) lactating rats and their litters were given a pyridoxin-free diet, beginning with the latter part of the lactation period; and (3) young rats, after a 5-, 10-, or 15-day period of depletion of all of the B vitamins, were given a pyridoxin-free diet plus graded doses of pyridoxin over a 10-day period, after which the supplement was discontinued. In all cases observations of growth and appearance of dermatitis showed a progressive increase in the rate of growth and corresponding delay in the onset of dermatitis correlated with the amount of the vitamin previously given. "These data suggest that the irregularity in the occurrence of dermatitis in rats deprived of pyridoxin (reported by several workers) may be ascribed, at least in part, to differences in the reserves of the vitamin present in the young animals at the beginning of the experiment."

The effectiveness of linoleic, arachidonic, and linolenic acids in reproduction and lactation, F. W. QUACKENBUSH, F. A. KUMMEROW, and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 3, pp. 213-224).—Two basal diets were used—(1) the diet previously described by Schneider and Steenbock (E. S. R., 81, p. 884) in which the B vitamins were furnished by a rice bran concentrate very low in lipides supplemented by riboflavin and (2) the Burr and Burr diet (E. S. R., 63, p. 595) in which the source of the B vitamins was ether-extracted yeast. The first of these diets was much lower than the second in

unsaturated lipides, furnishing only 0.8 mg. calculated as linoleic acid per 10 gm. of food intake, as compared with 13 mg. for the second. Both diets were supplemented with 100 μ g. each of carotene and vitamin K₁, 35 μ g. of calciferol, and 350 μ g. of tocopherol per rat per week. The experimental litters, with their mothers, were transferred from the stock diet at 12 days of age to a diet consisting largely of potatoes (E. S. R., 81, p. 600), weaned at a weight of 40 gm., and placed on one or the other of the two diets, with or without stated supplements of the fatty acids.

On both of the basal diets the rats were raised to maturity and bred, but after a prolonged gestation period and severe hemorrhage on parturition, the young were born dead or died soon after birth. When the diet was supplemented with fatty acids, growth was better on the rice bran than on the yeast diet. However, contrary to earlier observations of Schneider et al. (E. S. R., 84, p. 422) that rice bran concentrate can completely replace the essential acids, it was shown that it cannot prevent scalliness of the feet and tail. This scaly condition was observed on both basal diets after about 10 weeks and was prevented or cured by ethyl linolate and arachidonate but not by ethyl linolenate. Reproduction was also normal on the first two but not on the third supplement. Analysis of body fat showed a remarkable constancy in both the percentage of total fat and iodine values of the fat irrespective of the dietary supplements.

Linoleic acid, pyridoxine, and pantothenic acid in rat dermatitis, F. W. QUACKENBUSH, H. STEENBOCK, F. A. KUMMEROW, and B. R. PLATZ, (Wis. Expt. Sta.). (*Jour. Nutr.*, 24 (1942), No. 3, pp. 225-234).—This report, extending earlier studies (E. S. R., 84, p. 422), deals with the interrelationship of the factors involved in rat dermatitis as observed when the supplements were given as pure compounds added to a basal diet containing no more than 0.003 percent of unsaturated lipide calculated as linoleic acid and only thiamin and riboflavin of the B vitamins. The test supplements, administered by dropper (singly and combined in prophylactic and curative tests), consisted of synthetic pyridoxin hydrochloride and calcium *d*-pantothenate in aqueous solution and ethyl linolate prepared from corn oil. The system noted in an earlier paper (E. S. R., 81, p. 600) was followed in evaluating the skin condition.

The weanling rats on the basal diet developed severe acrodynia in from 4 to 5 weeks. "Pantothenic acid did not even alleviate the symptoms. Pyridoxin produced temporary alleviation but did not effect a cure. Ethyl linolate cured the acrodynia. Amounts of linolate which were subcurative alone became curative when given with pyridoxin. Pantothenic acid together with pyridoxin improved the dermal condition, and linolate subsequently produced further improvement. The three compounds together cured the acrodynia but did not cure completely the scaly condition of the tail and hind paws. The results indicate that an additional factor is involved. In prophylactic tests neither pantothenic acid nor pyridoxin prevented the acrodynia, but pyridoxin retarded the development of the dermal lesions. A lack of pyridoxin did not result in acrodynia when animals were fed both linoleic acid (corn oil) and pantothenic acid." These findings are compared with reports from other laboratories, and suggestions are given in explanation of such minor differences as have been found.

Ascorbic acid content of some canned grapefruit juices prepared under various processing conditions, W. W. FLOYD and G. S. FRAPS. (Tex. Expt. Sta. et al.). (*Food Res.*, 7 (1942), No. 5, pp. 382-387).—The samples of canned grapefruit juice, obtained with the cooperation of the leading citrus fruit canners of the Rio Grande Valley, were prepared under conditions of large-scale processing. Comparable samples representative of different commercial practices and samples of fresh, raw juice were analyzed for ascorbic acid by the dye titration method

according to a procedure outlined briefly. Twenty-one samples of fresh, raw juice from first-grade, tree-ripened grapefruit contained an average of 41.2 mg. ascorbic acid, with a minimum of 38.3 and a maximum of 46.4 mg. per 100 gm. The 109 samples of canned grapefruit juice averaged 33.7 mg. ascorbic acid (range, 26.3–39 mg.), this being 18.2 percent lower than the value for the fresh juice. Canned grapefruit juice that had been permitted to stand between extraction and processing for 3.5 or less, 5, 20, and 30 min. averaged, respectively, 38.5, 36.6, 29.0, and 26.9 mg. ascorbic acid per 100 gm.: these values, compared with the 41.2 mg. for fresh, raw juice, represented losses ranging from 6.6 to 34.7 percent. Canned juice from fruit containing approximately 90 percent of culls contained 29.5 mg. ascorbic acid as compared with 36.1 mg. in juices from fruit containing 10 percent or less of culls. Canned juice from fruit picked just after a February freeze averaged 31.1 mg. ascorbic acid per 100 gm., while canned juice from fruits that had been gathered in the same region just before the freeze contained 36.0 mg. per 100 gm. Juice prepared with machines using corrugated rollers or a rotary grater contained a little more ascorbic acid than that prepared by screen pressing or hand reaming.

The vitamin C content of small fruits, R. A. LINEBERRY and L. BURKHART. (N. C. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 41 (1942), pp. 198–200).—The berries were sampled and analyzed by the procedure described by the authors in a study of vitamin C and its sampling variation in strawberries (E. S. R., 88, p. 713). Blueberries contained much less ascorbic acid than did the strawberries, which had shown varietal averages ranging from 33 to 66 mg. per 100 gm., but, unlike the strawberries, did not show much varietal difference in ascorbic acid content. The ripe fruit of Cabot, Rancocas, Scammell, and Concord varieties of blueberries averaged, respectively, 18.6, 18.4, 16.5, and 16.0 mg. per 100 gm.; green Scammell blueberries contained only 3.3 mg. per 100 gm. Young, Boysen, and Lucretia varieties of dewberries averaged, respectively, 32.5, 25.9, and 27.0 mg. of ascorbic acid per 100 gm.; Dixie, Latham and Newburgh raspberries 32.5, 23.5, and 20.5, mg.; Early Wonder blackberry 23.5 mg.; and the Brainerd blackberry in the ripe and red stages, respectively, 12.9 and 11.6 mg. per 100 gm. of fruit.

Vitamin C (ascorbic acid) content of the buffalo-berry, D. KNOWLES and I. WILK. (N. Dak. Expt. Sta.). (*Science*, 97 (1943), No. 2506, p. 43).—Ascorbic acid was determined by the method of Morell (E. S. R., 87, p. 15) in the buffalo-berry, (*Lepargyrea* (= *Sepherdia*) *argentea*), a native fruit of North Dakota. The ripe fruit on the fresh basis contained over 150 mg. per 100 gm., and one sample picked on October 15, 1942, contained as much as 184 mg. Samples of buffaloberry jam contained from 80 to 90 mg. of the vitamin per 100 gm.

Vitamin C content of persimmon leaves and fruits, C. G. VINSON and F. B. CROSS. (Univ. Mo. and Okla. A. and M. Col.). (*Science*, 96 (1942), No. 2497, pp. 430–431).—Fresh green leaves from three wild persimmon trees and five named and cultivated varieties varied in ascorbic acid content, as determined by the dye titration method, from 2,030 to 3,280 mg. per 100 gm. Leaves recently dried in a Bussler oven varied from 2,550 to 4,150 mg. per 100 gm. (six samples), the green fruit (six samples) from 210 to 380 mg., and the ripe fruit (two samples) from 95 to 105 mg. per 100 gm. A tea made from the green or the dried leaves was found to be very acceptable after the addition of a little sugar. Tea made from the dried persimmon leaf contained about 60 percent of the titratable material originally in the leaf, but tea made from the green leaves contained only about one-third as much of the titratable material as did tea from the dried leaves. The titratable material in tea from tea leaves was only about 1 percent of the amount in the infusion from an equal weight of dried persimmon leaves.

Rose-hip syrup: Vitamin C content and stability, F. WOKES, E. H. JOHNSON, J. DUNCAN, J. G. ORGAN, and F. C. JACOBY (*Food*, 11 (1942), No. 131, pp. 212-213).—A brief general report of experience with rose hips and rose-hip syrups indicates that there were seasonal and regional variations in the ascorbic acid content of the rose hips and losses upon storage or drying of the hips or storage of the extract. Commercial syrups varied in potency and lost from 5 to 10 percent of their ascorbic acid per week when stored at 37° C., but only 1 percent at 5°. Tests with pure solutions of ascorbic acid indicated that increase in pH from 1 to 3.8 (about the lowest value for a palatable sirup) increased the rate of destruction of the ascorbic acid, and that the presence of sugar stabilized the vitamin against destruction. Storage of rose-hip sirup under nitrogen decreased but did not eliminate the destruction of the vitamin due to oxidation.

Tomato catsup as a source of vitamin C, W. B. ESSELEN, JR., and H. FRAM. (Mass. Expt. Sta.). (*Jour. Home Econ.*, 34 (1942), No. 9, pp. 677-678).—Ascorbic acid was determined by the 2,6-dichlorophenolindophenol dye titration method in eight brands of catsup obtained in 14-oz. bottles, chiefly from local markets but some also directly from large catsup packers. The former samples were representative of those that had been handled under commercial conditions for from 9 to 12 mo., while the latter were fresh samples which had been packed only about 1 mo. Average figures for ascorbic acid in the several brands varied from 5.50 to 12.00 mg. per 100 gm., and the limited data indicated that there was a definite loss of ascorbic acid in the catsup stored for 1 yr.

Loss of vitamin C during cooking of summer squash, R. N. WOODRUFF and F. I. SCOULAR (*Food Res.*, 7 (1942), No. 4, pp. 267-271).—Two varieties of Texas-grown summer squash, White Patty Pan and Yellow Crookneck, contained, respectively, 29 and 30 mg. of ascorbic acid per 100 gm. when analyzed as garden-fresh samples and 23 and 22 mg. when analyzed after holding for 8 hr. in a local market. Holding under market conditions for as long as 4 days, as was done with the White Patty Pan variety, caused a reduction to 13 mg. per 100 gm. Cooking the squash cut in small pieces caused similar losses in the two varieties. Boiling for 10, 20, and 30 min. caused losses in these respective periods ranging from 39 to 43 percent, 49 to 57, and 53 to 62 percent in the various lots of garden-fresh or market-held samples. Boiling in salted water did not affect the size of the losses; boiling as whole, uncut squash rather than as diced or sliced samples resulted in somewhat smaller losses (42-45 percent) in the 20-min. period. Baking (White Patty Pan variety) for 20 min. following a 5-min. parboiling period effected greater losses than did boiling, from 65 to 67 percent of the ascorbic acid being lost if the squash was baked whole and from 70 to 73 percent if the sample was cut as for the preparation of stuffed squash. The greatest cooking losses (72 to 77 percent) resulted in samples diced or sliced, then boiled 3 min., and sautéed in fat for 10 min.

A study of the ascorbic acid requirements of children of early school age, V. M. and L. J. ROBERTS (*Jour. Nutr.*, 24 (1942), No. 1, pp. 25-39, figs. 3).—Two girls and three boys between the ages of 7 and 12 yr. living in a home for crippled and convalescent children served as subjects. The general plan of the study consisted in following the changes in blood levels and urinary excretion of ascorbic acid as the intake was increased at stated levels from an initial level of 15 mg. as furnished in the basal diet alone. There were eight experimental periods of 7 days each. The first week 40 mg. of ascorbic acid was given daily as a supplement to the basal diet, and this was increased by 20 mg. daily each week until the blood level remained practically constant with increased intake. The supplement was then gradually decreased until the 50-mg. level was reached for four subjects and 90 mg. for the fifth. At the end of each period a test dose

of 300 mg. of ascorbic acid was given to determine the state of tissue saturation. The requirements for the individual subjects were calculated according to several criteria, particularly the intake required to maintain average retention values, the intake to insure saturation as indicated by 50 percent excretion of a 300-mg. test dose, and the intake to maintain a blood level of 0.7 mg. or above. In this order the requirements ranged from 55 to 75, from 55 to 75, and from 55 to 65 mg. daily. By all three criteria, 65 mg. was the daily requirement of the two youngest and 75 mg. of the three oldest subjects. With other methods of interpretation the requirements varied from these amounts up to 125 mg., representing the intake to maintain maximum blood levels.

Vitamin H, biotin, and coenzyme R: A brief review of the literature, M. LANDY (*Chagrin Falls, Ohio: Res. Labs. S. M. A. Corp., 1941, pp. 13*).—A chronological review of the literature, with 58 references, to May 1941.

TEXTILES AND CLOTHING

Fabrics, G. G. DENNY, edited by B. R. ANDREWS (*Chicago: J. B. Lippincott Co., [1942], 5. ed., rev., pp. XI+202, figs. [98]*).—This new and enlarged edition (E. S. R., 76, p. 283), giving definitions of fabrics and textile terms, records the progress and changes in textile products. The number of illustrations has been increased by one-third and many of the older ones have been replaced with new cuts. More attention than formerly is given to the importance of fibers, which are shown with photomicrographs and drawings, and special emphasis is placed on industrial fabrics. A brief section is devoted to the classification of fibers and to a representative list of trade terms for fabrics and finishes, with the names of manufacturers; textile tests and fiber analysis are considered; and Trade Practice Rules of the Federal Trade Commission are brought up to date.

Fabrics for war, S. M. SPENCER (*Textile Res., 12 (1942), No. 12, pp. 22-27, figs. 3*).—This brief summary points out some of the special applications for war needs of fabrics or treated fabrics such as Nylon, high tenacity rayon, and fabrics that are flameproofed, made water-repellent, waterproof, mildew-proof, or effective for concealment because of the satisfactory quality of the dyes. Most of the fabric treatments and coatings now proving so valuable in war are products of peacetime research.

Quantitative analysis of linen in part linen fabrics, W. KRAUSS (*Rayon Textile Mo., 23 (1942), Nos. 11, pp. 49-50, fig. 1; 12, pp. 53-54, fig. 1*).—Since the time required for the A. S. T. M. method of microscopic analysis for cotton-linen mixtures is too great for routine checks of part-linen fabrics, a new method is proposed which utilizes a larger sample than that used in the former method, thus eliminating lack of uniformity of the sample as a factor in the quantitative determination. According to this procedure, which is described in detail, a fabric sample of at least 2 by 2 in. or a yarn sample of 2-yl. length is used. From the fabric a number of yarns proportional to the thread count of the sample are pulled at random from each direction, the combined number of yarns from warp and filling totaling at least 20, and from the yarn sample twenty 2-in. lengths are cut at intervals. From each yarn or yarn section thus selected 1-mm. sections are cut to a total of about 1 in., and these small sections, properly assembled, are separated into individual fiber sections by shaking in a flask with about 75-100 cc. of distilled water. About $\frac{1}{2}$ cc. of the well-shaken suspension is flooded onto a glass slide between the confines of two vertical lines drawn about 1 in. apart with a wax pencil; after drying uniformly the fibers are stained with Herzberg stain and covered with a 1-in. coverglass. After proper identification of the fibers on the slide, an actual counting of the fibers in the mixture is made at a magnification

of 200-250 diameters and with the use of a mechanical stage and a cross-hair ocular. The combined horizontal and vertical counts should total at least 1,000 fibers. The fiber diameter is determined on a total of about 100 fibers from the yarns (not the fiber suspension) mounted longitudinally in glycerol. The weight of the various fibers is calculated by multiplying the number of fibers by the square of their diameter and by their specific gravity, and from these figures percentages by weight can be calculated.

Colorfastness of women's and children's wearing apparel fabrics, H. E. BORTON, M. BUTZ, P. B. K. MOORE, D. D. WILLIAMSON, I. LA BOSSIER, B. BLACKMORE, B. KUSCHKE and P. B. MACK. (Pa., R. I., N. H., Md., N. J., and [N. Y.], Cornell Expt. Stas. and Pa. State Col.). (*Jour. Home Econ.*, 34 (1942), No. 8, pt 1, pp. 539-550, fig. 1).—The present report of the Northeastern Regional Experiment Station Cooperative Textile Project (E. S. R., 81, p. 154), still in progress, is based on the findings of (1) laboratory tests of 1,000 colored fabrics and (2) inspections of worn-out garments in which 211 of these fabrics were observed for practical wearing performance in various women's and children's clothes. Of the 1,000 fabrics, 32.8 percent were cotton, 10.5 wool, 7.7 wool mixtures, 8.5 silk, 22.9 viscose, 2.2 acetate, 12.0 viscose and acetate, and 3.4 percent rayon mixtures other than those of viscose and acetate. The fabrics were rated by the series of tests for colorfastness recommended by the National Bureau of Standards for woven textile fabrics, as showing (1) no observable fading, (2) only slight fading, (3) some fading, and (4) severe fading. "All fabrics, regardless of fiber content, had an over-all average of 65.9 percent in the highest class of performance with respect to the following 10 colorfastness tests: Laundering (cotton), laundering (rayon), dry cleaning by the dry method, dry cleaning by the wet method, light, artificial acid perspiration, artificial alkaline perspiration, crocking dry, crocking wet, and pressing. The poorest average responses to the tests were found with the wet crocking and light tests. Other tests gave progressively better results in this order: Dry cleaning (wet); perspiration, alkaline; laundering (rayon); perspiration, acid; laundering (cotton); crocking (dry); pressing; dry cleaning (dry) (which showed the best response of any of the tests). The study clearly indicates the need for colorfastness standards for all types of wearing-apparel fabrics, with labeling to show the consumer the kind of colorfastness performance to be expected in a certain fabric."

The wearing apparel, for which the consumer records were entirely adequate, was returned for inspection to ascertain how closely the laboratory methods predicted the actual performance of the fabrics during wear. "Many of the tests failed to predict actual wear performance in any but a small percentage of the cases, the error being more frequently on the side of the test's being too mild than on the side of its being too rigorous. The need for more rigorous tolerances in applying the tests and in interpreting the results was indicated. In the case of the test for colorfastness to light, as an example, the method of conducting the test was satisfactory but a longer period of light exposure seemed desirable. In the case of the laundering test, a number of successive applications of the present test, or an accelerated one-wash test giving results equivalent to a multiple-washing test rather than the present use of one test, seems desirable if the test is to predict colorfastness of fabrics in consumer use, where repeated launderings are applied."

Mildewproofing of military fabrics, C. W. HOCK and M. HARRIS (*Rayon Textile Mo.*, 23 (1942), Nos. 11, p. 70; 12, pp. 47-48).—A greatly increased demand for mildew-proof fabrics for sandbags, camouflage cloth, and other materials has brought up many new production problems. The present status of the situation is outlined in the present report, which considers briefly the cause of mildew, re-

quirements for satisfactory mildew-proofing agents, compounds used for mildew-proofing, application of agents, toxicity, and tests for mildew-proofing. Laboratories carrying on investigations related to mildew-proofing are noted, and references to the literature on the subject are presented.

How to sell and care for rayon and wool blended fabrics, A. TEN EyCK (*Rayon Textile Mo.*, 23 (1942), No. 11, pp. 60-61).—It is recognized that neither merchant nor consumer has a great deal of information on spun rayon and wool blended fabrics, but that in the present wartime economy such information is needed to sell these fabrics to consumers "positively" and not as a substitute. This article, concerned with the properly constructed and finished blended fabrics, tells what they are, how well they will wear, and how to care for them. Valuable hints are given on washing, drying, pressing, dry cleaning, and stain removal.

Analysis of 84 qualities of cotton dress prints, M. M. HAYS and G. B. FRANKENBERG. (U. S. D. A.). (*Rayon Textile Mo.*, 23 (1942), Nos. 10, pp. 74-76, fig. 1; 11, p. 69).—This study was conducted cooperatively by the U. S. D. A. Bureau of Home Economics and the Farm Security Administration in the interest of assisting managers of cooperative association stores in the South to stock more satisfactory fabrics for purchase by Farm Security families. The fabrics, obtained from cooperative stores in several regions and from large retail and mail-order houses, were divided into four groups on the basis of their so-called gray counts (60 by 48 and lower, 64 by 60, 68 by 72, and 80 by 80) and were tested by standard procedures, which are noted briefly. The results, summarized and analyzed, indicated that finishing increased the warp count and decreased the filling count, although the total number of warp and filling yarns remained approximately the same. The grab breaking values were in general directly related to the count, although there were several fabrics in each group that had approximately the same strength. The grab values for breaking strength were usually higher than those obtained by the strip method, but the values by the two methods were correlated. The loss of weight on desizing decreased in general as the count increased, although there was some overlapping, and varied from 6.0 to 30.0 percent in the 60 by 48 and lower fabrics to from 1.5 to 8.9 in type 180 fabrics; 7 out of 43 of this latter type had finishing losses of 3 percent or less. Poor colorfastness to light was characteristic of many of the fabrics, only 27 of the 84 rating class 3 or higher (i. e., expected to give satisfactory performance when good fastness to light is essential). As a group, however, the fabrics showed excellent colorfastness to washing. The information given on the labels on the fabrics was the only guide available to the purchasers. It showed count in only 12 cases and colorfastness in somewhat more, but often in a misleading way, since no distinction was made between colorfastness to light and to washing, and since the statements were not always borne out by the tests.

Additional information is being gathered from consumer service tests on these fabrics to serve as a basis for setting minimum specifications for dress prints to be sold in F. S. A. stores. Tentatively, it is proposed that dress fabrics should classify 3 or higher to light and also to washing, and that warp breaking strength by the grab method should be not less than 38, 40, and 42 lb. for prints of types 124, 140, and 160, respectively; for the filling direction the minimum should be 20, 28, and 30 lb. The minimum weight per square yard should be 2.4, 2.6, and 2.8 oz. for the three types.

Development of soybean fiber by Ford, L. STOFFER (*Rayon Textile Mo.*, 23 (1942), No. 11, pp. 45-48, figs. 6).—"Output of the synthetic fiber—the first successful textile filament to be derived from a vegetable protein source—is already around 1,000 lb. a day in the pilot plant, which has been in operation since early 1941, and will reach 5,000 lb. a day in the new plant." The bulk of

this present and future output is going into textile products for the armed services. The process of fiber production consists essentially in extraction of the protein from the dried oil-free meal by a weakly alkaline solvent such as 0.1 percent sodium sulfite solution, clarification of the solution, and precipitation of the protein with an acid, the resulting curd being washed and dried. The protein is then dissolved by a special process to give a viscous solution containing 20 percent protein. This solution is forced through spinnerettes, containing from 500 to 5,000 apertures in a surface $1\frac{1}{2}$ in. in diameter, into an acid bath which coagulates the tiny filaments. These are stretched as they are pulled through the bath, and as they emerge they are gathered together and combined into a single yarn. The fiber may be wound on a reel and can then be bleached and dried if desired. The fiber is removed from the reels in skein form to be cut to any staple length desired. The fiber is white to light tan in color, with medium luster; is nearly circular and has little pigmentation; has sp. gr. 1.31 measured in water; has a warm soft feel, a natural crimp that imparts a high degree of resiliency, and a strength well above 80 percent of that of virgin wool; and is very resistant to the action of mold.

Substitutes for jute and manila fibers, A. C. WHITFORD (*Textile Res.*, 12 (1942), No. 12, pp. 2-7, figs. 3).—Four types of fibers that have found satisfactory use for a long time, are known to have very desirable qualities, and are adapted to production in the United States are suggested as the best substitutes for jute and manila fibers. These four are *Sansevieria* (*S. zeylanica* and *S. guineensis* (= *thyrsiflora*), known as bowstring hemp and Guinea bowstring hemp), *Hibiscus esculentus* (okra), *H. cannabinus*, and *Urena lobata* known as Caesar weed or French cocklebur. The first two are coarse rope fibers and the latter two finer jutelike materials. These plants are discussed with regard to ease of production, yield, time required before production can begin, and adaptability to replace manila and jute.

Wearing qualities of similar brands of silk and Nylon hose compared, G. M. SMITH and H. M. FLETCHER. (Kans. Expt. Sta.). (*Rayon Textile Mo.*, 23 (1942), Nos. 11, pp. 75-76; 12, pp. 62-63, 64).—Four popular brands of hosiery, including a total of 22 pairs of silk and 17 pairs of Nylon hose, were represented in this study in which 1 pair of silk and 1 of Nylon of each brand were used as controls, while the others were subjected to actual wear tests, all hose of one brand being worn by a single person for whom the hose were chosen for size and leg length. Data concerning the physical characteristics of the hose, the results of bursting tests on the control and the worn hose, and wear and fading results with the latter are presented and discussed. Statistical analysis of the data to determine the significance of the differences between silk and Nylon hose showed that the Nylon hose—control and worn—were superior to the silk in bursting strength at the knee and in the leg. The silk and Nylon controls were not significantly different as to bursting strengths of heel, ankle, and welt, but the toe of the silk controls was stronger than that of the Nylon. With wear, however, more holes were worn in the toes and heels of silk hose than in the Nylon. Most of the failures in both types of hose were due to snags that developed into runs. The number of hours of service for the Nylon averaged 448.59 and for the silk, 156.74. The Nylon faded more than the silk, due probably to the greater length of time worn and the greater number of times laundered. The silk hose were laundered an average of 12.2 times and the Nylon 33.5 times. Under these conditions and using a 15-hr. day as the basis, the silk hose cost 9.9 ct. per day and the Nylon 4.5 ct. Although the initial cost of the Nylon—\$1.35 a pair—was greater, they wore so much longer that the cost was about half that of the silk hose, which initially cost from \$1 to \$1.15 a pair.

Mending men's suits, C. L. SCOTT and A. F. HAGOOD (*U. S. Dept. Agr., Misc. Pub. 482 (1943), pp. 24, figs. 31*).—This publication describes and illustrates ways to strengthen for longer wear, to repair, to alter, and to care for men's suits and overcoats.

MISCELLANEOUS

The use of tests of significance in an agricultural experiment station, G. W. SNEDECOR. (Iowa State Col.). (*Jour. Amer. Statis. Assoc.*, 37 (1942), No. 219, pp. 383-386).—An appeal to express tests of significance of experiments in terms of probability.

Wartime service for Arkansas agriculture: Fifty-fourth Annual Report [of Arkansas Station, 1942], W. R. HORLACHER (*Arkansas Sta. Bul. 428 (1942), pp. 55, figs. 6*).⁴

Science serving agriculture: Biennial Report [of Oklahoma Station, 1941-42], I, II, W. L. BLIZZARD and L. E. HAWKINS (*Oklahoma Sta. Bien. Rpt. 1941-42, pls. 1, pp. 92, figs. 45; 2, pp. 23*).⁴

Colorado Farm Bulletin, [October-December 1942] (*Colo. Farm Bul. [Colorado Sta.], 4 (1942), No. 4, pp. 15, figs. 5*).—In addition to several articles noted elsewhere in this issue, this number contains the following: Problems Born of War Present Challenge to Experiment Station; Program Revised (pp. 6-8); Bulk Storage of Potatoes To Save Burlap Costs No More, Former Study Shows, R. T. Burdick (pp. 9-10); and Lime Has Importance in Feedlot Ration, in Sanitation, and in Treatment of Manure (pp. 13-15).

Publications available from the [Kansas] Agricultural Experiment Station (*Kansas Sta. Cir. 211 (1942), pp. [4]*).—The available bulletins and circulars, classified under agricultural economics, agricultural production, and home economics, are listed.

Notas sobre el progreso de la agricultura y las industrias agropecuarias de Tucuman durante los ultimos sesenta años [Progress of agriculture and animal industry in Tucumán during the last 60 years], W. E. CROSS (*Bol. Estac. Eapt. Agr. Tucumán, No. 36 (1942), pp. 75, figs. 11*).—Progress since 1882 is reviewed under the headings of factors of progress, including an account of the agricultural experiment station at Tucumán; the sugar industry; and general agriculture.

New conditions and the agricultural industry: Report of the Department of Agriculture and Forestry and Food Control Organization for the year ended 31 August, 1942, P. R. VILJOEN (*Farming in So. Africa, 18 (1943), No. 202, pp. 64, figs. 8*).

⁴ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Florida Station.—Ralph L. Smith, assistant agronomist of the South Carolina Edisto Substation, has been appointed associate agronomist in charge of Mobile Unit No. 2 of the North Florida Substation, with headquarters at Milton. Mobile Units, working directly with growers as provided for by the State Legislature in 1941, were set up "for the purpose of study and research in growing, development, and demonstration of peanuts, velvetbeans, sweetpotatoes, corn, cotton, pasturage, and forage crops."

Georgia Station.—Dehydration equipment in the station laboratories is being used regularly by vocational agriculture teachers and others to gain information useful in running community dehydration plants.

Recent appointments include Dr. E. S. Lufftrel as associate botanist and H. G. Baker as associate agronomist, replacing Dr. Kenneth H. Garren and S. V. Stacy, who are now in the Army, and O. L. Brooks as agronomist at the Mountain Substation vice J. C. Mercer, recently resigned to join the U. S. D. A. Soil Conservation Service. Dr. F. F. Cowart, a former associate horticulturist, has returned to the station.

Kansas College and Station.—Waxy Club, a cross between Leoti Red and Club Kafir, has been released for commercial production as a replacement source of starch for tapioca and other tropical roots. This variety is apparently free from an objectionable water-free pigment found in starches obtained from other sorghum varieties.

According to a note in *Kansas Industrialist*, Dr. Earl B. Working, professor of the milling industry, has resigned to accept a position as director of chemical research with the Haitian-American Society for Agricultural Development and will carry on studies in the production of rubber from *Cryptostegia*. Frank S. Burson has resigned as extension instructor in agricultural economics.

Louisiana Station.—Clarence W. Dubois has been appointed research associate in food preservation and will direct investigations with special reference to quick freezing.

Massachusetts College and Station.—Frank A. Waugh, emeritus professor of landscape architecture, died on March 20 in New York City. Born in Sheboygan, Wis., on July 8, 1869, he received from the Kansas College the B. S. degree in 1891 and the M. S. degree in 1893. He had also been a student in Cornell University and the horticultural schools in Germany and France. He was assistant horticulturist in the Kansas College in 1891, professor of horticulture and horticulturist in the Oklahoma College and Station from 1892 to 1895 and the Vermont University and Station from 1895 to 1902. Coming to Massachusetts in the latter year as head of the department of horticulture, he greatly enlarged its activities, especially in what was then the relatively pioneer field of landscape engineering. From 1932 to his retirement in 1939 he had been professor and head of the department of landscape architecture. He exercised a wide influence by the training of men in this field and also as the author of many textbooks and other writings in pomology, landscape gardening, and rural improvement.

Montana College and Station.—O. A. Parsons, associate professor and assistant in agricultural economics, has been given leave of absence for military service.

New Mexico College and Station.—J. O. Bridges, associate professor of animal husbandry and associate animal husbandman, has resigned to engage in livestock production and farming in Idaho.

Cornell University.—John H. Barron, extension professor of field crops, retired on March 1 following 32 years of service in extension work.

New York State Station.—Simple and practical methods for comparing the merits of different detergents and cleaning compounds used by food processors, milk plants, farmers who are dispensing fruit and vegetable juices, and others concerned with the cleaning and sterilizing of food processing equipment have been worked out at the station. Processors of fruit and vegetable juices are finding these studies are also helpful in cleaning and sterilizing the glass containers returned by patrons.

Dr. Donald K. Tressler, who has headed the work of the chemistry division at the State station here since 1933, has entered the employ of the General Electric Company. His new work will have to do chiefly with the research program at the Bridgeport, Conn., laboratories of the company, with particular reference to refrigeration and the freezing preservation of foods.

Walter D. Enzie has resigned as assistant professor of vegetable crops to continue vegetable crop breeding and variety testing for the Snider Packing Corporation in Albion, N. Y. Thressa Campbell, investigator in bacteriology, has accepted a position in the department of fruit products in the California Station and has been succeeded by Robert C. Thomas.

North Dakota College and Station.—Dr. John C. McDowell, assistant professor of agriculture in 1903-4 and professor of agriculture in 1905-8 and subsequently associated with the U. S. Department of Agriculture until his retirement in 1937, died in Washington, D. C., March 31 at the age of 75 years. A native of Wisconsin and a graduate of the University of Wisconsin in 1903, he received from American University the A. M. degree in 1925 and the Ph. D. degree in 1927. His early work with the Department was in the field of farm management, and from 1916 he was associated with the Bureau of Dairy Industry as senior animal husbandman and chief of its dairy herd improvement investigations. He was the author of several books, including a Boy Scout Handbook on Dairy Farming.

Clemson College.—H. H. Willis, dean of the textile school, has resigned, and R. K. Eaton, professor of carding and spinning, has been appointed acting dean.

Wyoming Station.—A new Adams project has been approved on postparturient mortality of Wyoming range cows. It is hoped the causative factor or factors involved in these losses and a method of preventing or controlling them may be determined. A thorough study of the symptoms and pathology of the disease will be made, as well as the value of therapeutic measures. The work will be carried on by the departments of animal production and veterinary science, with blood analyses by the department of research chemistry.

Inter-American Institute of Agricultural Sciences.—The formal dedication of this institute (E. S. R., 88, p. 576) took place on March 19. The principal speaker was Vice President Henry A. Wallace, then on his tour of Central and South America. In his address Mr. Wallace visualized the institute as a focal point of research in the field of tropical agriculture, drawing students and investigators from all sections of the Western Hemisphere.

Announcement has been made that despite the scarcity of building materials the institute will be completed in 1943.

INDEX OF NAMES

Aamodt, O. S., 618.
Aamodt, T. L., 500.
Aasheim, T. S., 429.
Abbe, E. C., 747.
Abbott, E. V., 205, 210.
Abel, G. W., 633.
Abels, J. C., 415.
Abmeyer, E., 618, 628.
Abraham, A., 179, 204.
Abraham, E. P., 172.
Ackerman, J., 536.
Ackerman, W. T., 235.
Ackert, J. E., 510, 676.
Acosta Solis, M., 169.
Adair, C. E., 623.
Adams, F., 328.
Adams, J. E., 143.
Adams, R. L., 272, 836.
Adams, W. R., 56, 143, 483.
Adamson, J. D., 242.
Adelaar, T. F., 323.
Afanasiev, M., 194, 342.
Agatov, P., 646.
Ahlgren, G. H., 187.
Aicher, L. C., 618.
Aikin, A., 718.
Airola, E. J., 47.
Akeley, R. V., 64, 351.
Åkerberg, E., 180.
Albanese, A. A., 730.
Alben, A. O., 773.
Albiston, H. E., 528.
Albrecht, H. R., 185, 350, 484.
Albrecht, W. A., 15, 41, 200, 604.
Albright, W. D., 234, 245.
Alcorn, G. B., 112.
Alden, R. H., 752.
Alderfer, R. B., 160.
Aldous, S. E., 360, 653.
Alemar, C., Jr., 628.
Alex, A. H., 25, 73.
Alexander, C. C., 80.
Alexander, L. J., 356.
Alexander, L. T., 7.
Alexander, M. A., 84.
Alexopoulos, C. J., 453.
Alfend, S., 596.
Algie, W. H., 677.
Allicata, J. E., 530.
Allard, H. A., 311.
Allee, R. H., 3.
Allen, C. E., 33.
Allen, D., 530.
Allen, D. I., 25.

Allen, D. L., 14.
Allen, E., 38.
Allen, E. A., 98, 532.
Allen, F. W., 634.
Allen, G. S., 200.
Allen, H. O., 585.
Allen, M. W., 484.
Allen, N. N., 143.
Allen, R. E., 15.
Allen, R. H., 428, 537, 693.
Allen, R. W., 250, 384, 531, 826.
Allison, F. E., 19, 461.
Allison, J. L., 640.
Allison, L. E., 164.
Allison, R. V., 19.
Allmendinger, D. F., 194, 632.
Allred, C. E., 124, 262, 267, 330, 403, 841, 844.
Allyn, W. J., 594.
Almack, R. B., 124.
Almquist, H. J., 237, 669, 801.
Alper, P., 728.
Alperovich, H. B., 323.
Alstyne, L. M. van, 767.
Altstatt, G. E., 58, 59, 106.
Alvarado, J. A., 204.
Alvarez Garcia, L. A., 71.
Alvis, J. K., 629, 692.
Amabile Aranda, R. J., 660.
Ambrose, A. M., 220.
Ameel, D. J., 248.
Amerine, M. A., 54.
Amos, A. J., 436.
Amundson, G., 692.
Anders, M. V., 36.
Andersen, H., 413.
Anderson, A. B. C., 161, 162, 447, 448, 737.
Anderson, A. C., 302.
Anderson, A. K., 681.
Anderson, C. A., 697.
Anderson, D. A., 451.
Anderson, D. C., 41.
Anderson, E., 579, 584, 621.
Anderson, E. E., 846.
Anderson, E. G., 346, 484.
Anderson, E. J., 722.
Anderson, E. O., 813, 819.
Anderson, G. W., 94, 523.
Anderson, H. D., 527.
Anderson, H. W., 343, 344, 356, 357, 640.
Anderson, J., 615.
Anderson, J. E., 579.

Anderson, J. M., 584.
Anderson, K., 818.
Anderson, K. L., 618, 655.
Anderson, L. D., 498, 782.
Anderson, P. J., 352.
Anderson, T. F., 149, 459, 746.
Anderson, T. G., 92, 671, 811.
Anderson, W. A., 845.
Anderson, W. S., 185, 189, 325.
Andison, H., 500.
Andrewes, C. H., 445.
Andrews, B. R., 863.
Andrews, F. N., 34, 38, 514, 614.
Andrews, F. S., 191.
Andrews, J. S., 151, 384, 596, 732.
Andrews, L. K., 255.
Andrews, W. B., 325, 733.
Andrus, C. F., 67, 355.
Angle, F. E., 677.
Angstein, L., 888.
Anslow, W. P., Jr., 724.
Anthony, J. L., 186, 325.
Anthony, R. D., 628.
Antopol, W., 418.
Apple, S. B., 764.
Appleton, W. C., 572.
Appling, J. W., 154.
Arana, F. E., 442, 579.
Arant, F. S., 786, 791.
Arbuckle, W. S., 5, 92.
Archbold, H. K., 171, 744.
Archer, J. C., 15.
Archer, W. F., 89.
Arentsen, S. S. T., 357, 430.
Armentrout, W. W., 722.
Armstrong, T. V., 520.
Armstrong, W. D., 52, 53, 567, 627.
Arnold, C. B., 243.
Arnold, F. A., Jr., 563.
Arnold, P. T. D., 673, 807.
Arnon, D. I., 603.
Arnoff, S., 9.
Aronovsky, S. I., 726.
Arpke, F., 840.
Arrillaga, N. G., 442, 579.
Arroyo, A., 623.
Asbury, S. E., 596.
Aschaffenburg, R., 381.
Ascham, L., 701.
Ashbrook, F. G., 497.
Ashburn, L. L., 391, 524, 525.

- Ashley, T. E., 143.
 Ashton, D. F., 662.
 Ashworth, J. T., 499.
 Ashworth, M. R. F., 597.
 Asmundson, V. S., 37, 183, 613, 750.
 Atkeson, F. W., 93, 671, 676.
 Atkin, L., 293, 430, 857.
 Atkins, I. M., 42.
 Atkinson, A., 144.
 Atkinson, H. J., 196.
 Atwell, E. A., 216.
 Atwood, A. C., 169.
 Atwood, F. C., 285.
 Atwood, S. S., 748.
 Au, M. H., 548.
 Aubel, C. E., 666.
 Auchter, E. C., 15.
 Auguston, G. F., 665.
 Autrey, K. M., 807, 809.
 Avens, A. W., 785.
 Avery, G. S., Jr., 28, 410, 462, 742.
 Axelrod, A. E., 853, 856, 859.
 Ayers, E. L., 19.
 Babcock, C. J., 92, 95, 96, 812, 814.
 Babel, F. J., 92.
 Bach, E. A., 221.
 Bachman, K. L., 396.
 Back, E. A., 98, 781, 782.
 Back, R. C., 781.
 Bacon, K. W., 45.
 Bader, M. N., 388.
 Baechler, R. H., 154, 254.
 Baerg, W. J., 72, 783.
 Bailey, B., 727.
 Bailey, E. M., 127, 373.
 Bailey, J. S., 339.
 Bailey, L. H., 585.
 Bailey, M. I., 856.
 Bailey, S. F., 72, 75, 781.
 Bailey, T. A., 22.
 Bailey, W. K., 619, 629.
 Bailey, W. W., 361.
 Baines, R. C., 776.
 Bair, R. A., 603.
 Baird, A. B., 657.
 Baird, F. D., 735.
 Baker, A. L., 610.
 Baker, C. E., 190, 766.
 Baker, F. T., 370.
 Baker, G. A., 515, 808.
 Baker, G. L., 482.
 Baker, H. G., 868.
 Baker, J. M., 122.
 Baker, M. L., 84, 610.
 Baker, N. R., 520.
 Baker, O. E., 261, 542.
 Baker, R. E., 47.
 Baker, R. E. D., 494, 778.
 Baker, R. L., 84.
 Baker, W., 172.
 Baker, W. A., 226.
 Baker, Z., 445.
 Balch, R. E., 219.
 Bald, J. G., 210, 773.
 Baldi, E. J., 674.
 Baldrige, J. D., 84.
 Baldof, W. V., 75.
 Baldwin, H. I., 200.
 Baldwin, I. L., 555, 769.
 Ball, H. J., 716.
 Ball, R. F., 740.
 Ballinger, R. A., 121, 122.
 Balls, A. K., 442, 570, 850.
 Balls, E. K., 25.
 Balmer, F. E., 144, 575.
 Balog, E., 545.
 Baltzer, A. C., 238.
 Baly, E. C. C., 316.
 Balzer, A. I., 73, 361.
 Bamford, R., 749.
 Bane, L., 144.
 Banerjee, S., 781.
 Bang, F. B., 386, 387, 824.
 Bankowski, R. A., 685.
 Barackman, R. A., 557, 585.
 Baragar, A. E., 287.
 Barber, F. W., 91.
 Barber, G. W., 226, 369.
 Barber, H. H., 586.
 Barborka, C. J., 280.
 Barden, R. D., 256.
 Barenberg, L. H., 444.
 Barer, A. P., 411.
 Barker, E. L., 833.
 Barghoorn, E. S., Jr., 310, 463.
 Barham, H. N., 579.
 Barkan, G., 154.
 Barker, D. K., 89.
 Barker, H. A., 67, 583.
 Barker, H. D., 716.
 Barker, S. B., 410.
 Barkman, J. O., 807.
 Barkworth, H., 381, 811.
 Barmington, R., 849.
 Barmore, M. A., 625.
 Barnes, H. F., 370.
 Barnett, C. E., 801.
 Barnett, R. J., 194, 628.
 Barnhart, C. S., 499.
 Barre, H. W., 185, 616.
 Barrentine, M., 213.
 Barrett, F. N., 670.
 Barron, J. H., 869.
 Barrons, K. C., 49, 630, 764.
 Barroso, L. J., 310.
 Bartell, F. E., 149.
 Bartholomew, R. P., 15, 40, 755.
 Bartlett, D. E., 820.
 Bartlett, I. H., 14.
 Bartlett, J. W., 90, 181, 610.
 Bartlett, K. A., 288, 655.
 Bartlett, M. K., 563.
 Bartley, W. C., 665.
 Barton, J. C., 247, 823.
 Basinger, A. J., 224.
 Basinski, D. H., 419.
 Bassett, C. F., 652.
 Batchelder, C. H., 226.
 Batchelder, E. L., 144, 562.
 Bateman, G. Q., 257, 673.
 Bateman, H. P., 252.
 Bates, W. D., 95, 192, 621.
 Bates, R. W., 183.
 Batjer, L. P., 336.
 Batson, F. S., 342.
 Batten, E. T., 186.
 Bauer, W., 265.
 Bauernfeind, J. C., 734.
 Baugh, L., 330.
 Baum, H. M., 417.
 Baum, M. P., 131.
 Baum, W. S., 855.
 Baur, E., 211.
 Bausor, S. C., 27, 461.
 Bayer, L. D., 16, 17, 144, 147, 185, 574.
 Bawden, F. C., 204.
 Baxter, D. V., 216, 780.
 Bayes, A. W., 422.
 Bayfield, E. G., 579, 618.
 Bayles, J. J., 47, 84.
 Baylis, G. T. S., 206, 209.
 Bazeley, P. L., 529.
 Beach, B. A., 527, 678, 820.
 Beach, F. A., 614, 752.
 Beach, J. R., 824.
 Beach, W. S., 628, 647.
 Beachell, H. M., 42, 623.
 Beadle, B. W., 292, 434.
 Beadle, G. W., 151, 180.
 Beal, J. A., 219, 229.
 Beal, J. M., 33.
 Beam, A. L., 671.
 Bear, F. E., 167, 168, 597, 738, 739.
 Beard, R. L., 228, 490, 507, 782.
 Beasley, J. O., 42, 467.
 Beasley, R., 105.
 Beasley, R. P., 41.
 Beattie, H. G., 10, 156, 274.
 Beattie, J. H., 763.
 Beattie, W. R., 763.
 Beaudette, F. R., 251, 750, 814.
 Beavens, E. A., 156, 442.
 Bechdel, S. I., 95, 671.
 Bechtel, H. E., 671.
 Beck, A. B., 389.
 Beck, G. H., 671.
 Beck, J. V., 583.
 Beckenbach, J. R., 192.
 Becker, E. R., 241.
 Becker, J. E., 181.
 Becker, W. B., 362.
 Becks, H., 183.
 Beckwith, T. D., 849.
 Becnel, I. J., 362, 500, 502.
 Bedenbaugh, P. G., 86.
 Bedford, C. L., 601.
 Bedford, Duke of, 38.
 Bee, L. S., 543.
 Beecher, F. S., 356.
 Beeson, K. C., 213.
 Behr, E. A., 651.
 Behrens, O. K., 582, 584.

- Beijerinck, M. W., 211.
 Beirne, B. P., 659, 661.
 Belding, D. L., 523.
 Belfer, S., 727.
 Bell, A. P., 428.
 Bell, C. L., 668.
 Bell, E. H., 406.
 Bell, F. G., 107.
 Bell, H. S., 449, 532.
 Bell, M. F., 352.
 Bellamy, R. E., 370.
 Belotelkin, K. T., 452.
 Belt, N. O., 108.
 Bemben, P. M., 288.
 Bendel, R., 226.
 Bender, C. B., 90, 519, 797.
 Benedict, M. R., 393.
 Benkó, A., 420.
 Benne, E. J., 585.
 Bennett, E. C., 584.
 Bennett, E. K., 718.
 Bennett, H. O., 767.
 Bennett, H. W., 85, 185, 186, 325, 739.
 Bennett, L. J., 652.
 Bennett, M. K., 128.
 Bennett, N. G., 573.
 Bennetts, H. W., 86, 389, 528.
 Benseid, D. W., 483.
 Benson, R. A., 710.
 Bentley, F. L., 666.
 Benton, R. J., 215.
 Benton, T. H., 16.
 Beresford, H., 259.
 Berg, C. I., 581, 582.
 Bergelm, O., 592.
 Berger, E. W., 223.
 Berger, J., 28, 462, 742.
 Bergman, A. J., 34, 183, 614.
 Bergman, M., 581.
 Berkley, E. E., 185.
 Berliner, V. R., 614.
 Berman, R. A., 589.
 Bernard, M., 299, 445.
 Bernstein, P., 633.
 Berousek, E. R., 90, 94.
 Berridge, A., 670.
 Berry, E. P., 376.
 Berry, P. M., 608.
 Berry, R. O., 35.
 Berryman, C. N., 575.
 Berryman, G. H., 845.
 Bertelli, J. C., 648.
 Bertholf, L. M., 795.
 Bertone, E., 427.
 Bertramson, B. R., 291.
 Bertrand, A. L., 698.
 Besley, L., 722.
 Besse, R. S., 720.
 Bessey, E. A., 27.
 Bessey, O. A., 136, 420.
 Best, C. H., 133.
 Bethell, F. H., 523.
 Bethke, R. M., 103, 878, 514.
 Betten, C., 144.
 Bever, W. M., 348.
 Beveridge, W. I. B., 389, 528.
 Biabie, J. B., 635.
 Bibby, F. F., 783.
 Bickerstaff, H. J., 131.
 Biddle, E. S., 101.
 Biddulph, C., 321.
 Biebel, J. P., 32, 763.
 Biefeld, L. P., 6.
 Biester, A., 549.
 Biester, H. E., 102.
 Bigg, E., 445.
 Bilsing, S. W., 73.
 Blitz, R. O., 825.
 Bina, A. F., 437, 556.
 Bing, F. C., 564, 565, 701.
 Binkley, A. M., 763.
 Binkley, F., 724.
 Binns, W., 575.
 Bird, F. H., 669.
 Bird, H. R., 376, 803, 804.
 Bird, J. A., 827.
 Bird, J. J., 44.
 Birdsall, B. J., 722.
 Birkeland, C. J., 628, 633, 721.
 Birkeland, J., 815.
 Bishop, A., 248.
 Bishop, D. W., 750.
 Bishop, R. K., 83.
 Bishopp, F. C., 97, 98, 664.
 Bisschop, J. H. R., 323.
 Bissell, T. L., 363, 499.
 Biswell, H. H., 115, 232.
 Bitancourt, A. A., 25, 357, 430.
 Bivins, J. A., 753.
 Bixler, D. A., 457.
 Bjorka, K., 694.
 Black, A., 143, 558.
 Black, J. D., 693.
 Black, R. H., 722.
 Black, S., 854.
 Black, W. H., 84, 181, 513, 514, 800.
 Blackfan, K. D., 444.
 Blackhurst, H. T., 47, 627.
 Blackmore, B., 864.
 Blair, W. M., 463.
 Blake, M. A., 634, 635.
 Blake, S. F., 169, 741.
 Blakeslee, A. F., 25.
 Blakeslee, L. H., 235, 513.
 Blanchard, E. L., 283.
 Blanchard, F. D., 621.
 Blanchard, R. A., 369, 793.
 Blaney, H. F., 298, 449.
 Blank, L. M., 59.
 Blanton, F. S., 495.
 Blasberg, C. H., 476, 485, 506.
 Blaser, R. E., 320, 622, 759, 797.
 Blasingame, R. U., 688.
 Bledsoe, R. P., 760.
 Blew, J. O., Jr., 254.
 Blickle, R. L., 220.
 Bliss, C. I., 364, 823.
 Bliss, D. E., 358.
 Blizzard, W. L., 429, 514, 867.
 Blodgett, E. C., 493, 648.
 Blood, H. L., 355.
 Blood, P. T., 187, 188.
 Bloom, E., 378, 379.
 Bloom, E. F., 10.
 Bloomfield, A. L., 816.
 Blundell, G. P., 600.
 Blyth, J. S. S., 321.
 Boals, G. P., 123, 405.
 Boardman, H. P., 300.
 Boche, R. D., 656.
 Bodansky, O., 282, 707.
 Boden, O. G., 392.
 Bodman, G. B., 447.
 Boelter, L. M. K., 593.
 Boerner, F., 383.
 Bogart, R., 34, 323.
 Bogert, L. J., 544.
 Boggess, T. S., Jr., 143.
 Boggs, M., 847.
 Bohart, R. M., 76, 79, 501.
 Bohonos, N., 175, 458, 744.
 Bohren, B. B., 517.
 Bohstedt, G., 514, 667, 808.
 Boles, H. P., 510.
 Bollman, J. L., 802.
 Bolton, W., 374.
 Bonar, L., 601.
 Bond, G., 176.
 Bond, L., 28.
 Bond, W. H., 84.
 Bondar, G., 740.
 Bonde, R., 64, 209.
 Bondi, A., 232, 234.
 Bondy, F. F., 368.
 Bonnell, D. E., 500.
 Bonner, F., 60.
 Bonner, J., 28.
 Bonser, H. J., 124, 262, 844.
 Bonsnes, R. W., 581, 725.
 Bonyng, C. W., 102.
 Booth, A. N., 667.
 Booth, R. G., 436.
 Borasky, R., 752.
 Borchers, R., 581, 582.
 Borden, R. J., 24, 45, 624, 625.
 Borges, M. de V., 495.
 Borland, A. A., 671.
 Bornmann, J. H., 586.
 Bornstein, B. T., 9, 11.
 Bornstein, S., 678.
 Borst, H. L., 17.
 Borthwick, H. A., 607.
 Bortner, C., 428.
 Borton, H. E., 864.
 Bortree, A. L., 90, 810.
 Boruff, C. S., 734.
 Bosanquet, C. I. C., 107.
 Bose, A. B., 211, 740.
 Bose, S. R., 770.
 Bosman, V., 668.
 Bostian, C. H., 376.
 Boswell, V. R., 188, 622, 763.
 Botsford, R. C., 499.
 Bottcher, E. J., 305.
 Bottger, G. T., 507, 508.
 Bottomley, A. C., 470.

- Boucher, R. V., 376, 377, 517, 667.
 Boudreau, F. G., 130.
 Boughey, A. S., 208.
 Boughton, D. C., 98, 819.
 Boughton, J. B., 99.
 Bouquet, A. G. B., 646.
 Bourne, A. I., 362.
 Bouyoucos, G. J., 16.
 Bowen, C. V., 498.
 Bowen, E., 422.
 Bower, C. A., 18.
 Bowie, A., 424, 718.
 Bowling, G. A., 94, 808.
 Bowman, D. H., 62.
 Bowman, D. R., 428.
 Bowman, G. W., 384.
 Bowser, P. H., 765.
 Bowstead, J. E., 389.
 Boyce, A. M., 224, 499.
 Boyce, E. B., 673.
 Boyce, E. F., 85, 454.
 Boyd, A. G., 687.
 Boyd, H. M., 732.
 Boyd, J. D., 566.
 Boyd, O. C., 58, 203.
 Boyd, W. C., 520.
 Boyer, C. A., 777.
 Boyer, P. D., 278, 809.
 Boyes, J., 176.
 Boyes, W. W., 713.
 Boyland, P. M., 573.
 Boynton, W. H., 245, 814.
 Bracken, A. F., 187.
 Brackett, E. E., 47, 106.
 Brackin, T. T., Jr., 662.
 Bradbury, J. T., 91, 752.
 Bradford, R., 144.
 Bradley, G. H., 81.
 Bradley, H. C., 727.
 Bradshaw, H. C., 111.
 Bradshaw, M. A., 441.
 Bragg, A. N., 498.
 Brain, E. D., 170.
 Brain, S. G., 618.
 Branaman, G. A., 233, 667.
 Brandes, E. W., 616, 627.
 Brandis, B., 693.
 Brandly, C. A., 98, 104.
 Brandow, G. E., 143.
 Brann, J. L., Jr., 785.
 Brannon, J. M., 575.
 Braude, R., 234, 376.
 Braun, A. C., 204, 774.
 Braun, A. E., 491.
 Braun, A. J., 777.
 Braun, E., 228.
 Braun, W. Q., 848.
 Bray, M. M., 550.
 Bray, R. W., 272.
 Bray, S. P. V., 370.
 Breaker, E. P., 74.
 Breaks, V., 530.
 Breed, R. S., 96.
 Breese, B. B., 855.
 Bremer, H., 771.
 Brenchley, W. E., 48.
 Breneman, W. R., 322.
 Brennén, C. A., 283.
 Brenner, M. W., 555.
 Brenner, S., 708.
 Bressler, R. G., Jr., 539, 841.
 Bressman, E. N., 3, 576.
 Bretherick, O., 82.
 Briant, A. M., 699.
 Bridges, J. O., 869.
 Bridges, M. A., 406, 852.
 Briggs, A. I., 418, 711.
 Briggs, F. N., 203, 747.
 Briggs, G. M., Jr., 669.
 Briggs, H. M., 514, 515.
 Briggs, L. C., 35.
 Brigham, W. T., 499.
 Brimley, C. S., 665.
 Brindley, J. M., 783.
 Brinegar, T. E., 41.
 Brink, R. A., 178.
 Brinkman, E. V. S., 847.
 Brinkman, K. A., 768.
 Brison, F. R., 47.
 Brite, A., 678.
 Brittingham, W. H., 42.
 Britton, J. W., 527.
 Broadbent, M., 531.
 Broadfoot, W. M., 722.
 Brodell, A. P., 108, 261, 392.
 Brodie, H. J., 642.
 Brodie, J., 425.
 Brodsky, R. H., 569.
 Brody, A. L., 817.
 Brody, E. B., 520.
 Brody, H. W., 213, 503.
 Brody, S., 84, 84, 90, 91, 92, 320.
 Bromley, S. W., 498, 782.
 Bronson, T. E., 409.
 Brookes, M. C. H., 708.
 Brookman, B., 385, 386.
 Brooks, F. A., 593.
 Brooks, G. L., 444.
 Brooks, H. J., 722.
 Brooks, L. E., 42, 84.
 Brooks, O. L., 808.
 Brooks, T. J., Jr., 246.
 Broome, F. K., 434.
 Brophy, D., 818.
 Broquist, H. P., 555.
 Brouse, E. M., 84, 575.
 Browder, S., 36.
 Brown, A. J., 539.
 Brown, A. W. A., 229, 363.
 Brown, B. A., 20, 758.
 Brown, B. E., 167.
 Brown, E. B., 417, 437, 556.
 Brown, E. M., 41, 84, 474, 757.
 Brown, G. A., 797.
 Brown, G. B., 581, 590.
 Brown, H. E., 72, 219, 244.
 Brown, H. L., 252.
 Brown, H. W., 246.
 Brown, I. C., 163.
 Brown, J. G., 631.
 Brown, L. M., 269.
 Brown, L. N., 328.
 Brown, M. S., 467.
 Brown, P., 665.
 Brown, P. C., 428.
 Brown, R., 315.
 Brown, R. L., 450.
 Brown, W. B., 784.
 Brown, W. C., 92.
 Brown, W. L., 580.
 Brown, W. O., 285.
 Brown, W. V., 311.
 Browning, D. R., 15.
 Brownlee, O. H., 111.
 Broyer, T. C., 67, 314.
 Brubaker, R. W., 362.
 Bruce, W. G., 98, 227.
 Brülcher E. G., 430.
 Bruckner, J. H., 377, 749.
 Bruen, E. J., 611.
 Brugger, L., 498.
 Brun, G. M., 750.
 Bruner, D. W., 251, 388, 428, 526, 817.
 Brunk, M. E., 836.
 Brunner, E. deS., 845.
 Brunson, A. M., 435, 436.
 Bryan, A. H., 561, 677.
 Bryan, C. S., 91, 674, 682, 821.
 Bryant, E. B., 83.
 Bryant, L. R., 776.
 Bryant, R. L., 257.
 Bryson, H. R., 655, 783.
 Bucha, H. C., 209.
 Buchanan, L. L., 387.
 Buchanan, M. T., 268, 695.
 Buchanan, R. E., 144, 147.
 Buchbinder, L., 445.
 Buchholtz, W. F., 203.
 Buck, J. B., 656.
 Buckner, G. D., 377, 805.
 Bueding, E., 280, 416.
 Buehrer, T. F., 461.
 Buhs, R. P., 593.
 Bulger, J. W., 506.
 Bull, L. B., 528.
 Bull, S., 295.
 Bullough, W. S., 38, 387, 614, 753.
 Bunyea, H., 98.
 Burch, D. S., 97.
 Burdick, H. O., 184.
 Burdick, R. T., 807.
 Burgess, P. S., 144.
 Burgwald, L. H., 520, 809.
 Burhans, M. E., 543.
 Burhoe, R. W., 445.
 Burk, D., 19.
 Burk, L. B., 403.
 Burkart, A., 25.
 Burke, E. M., 89.
 Burkhart, E. Z., 752.
 Burkhart, L., 713, 861.
 Burkholder, C. L., 194.

- Burkholder, P. R., 318.
 Burkholder, W. H., 643.
 Burleigh, H. P., 448.
 Burnet, F. M., 242.
 Burns Brown, W., 784.
 Burns, G. P., 33, 483.
 Burr, G. O., 316, 701.
 Burr, W. W., 142.
 Burrill, L. M., 540.
 Burrill, M. W., 30, 321.
 Burris, R. H., 726.
 Burroughs, W., 103.
 Burrows, W. H., 38, 472.
 Burson, F. S., 868.
 Burton, G. W., 350, 622.
 Burton, I. F., 566.
 Burton, I. W., 820.
 Busbey, R. L., 72, 76, 366, 782, 788, 789.
 Bushnell, L. D., 26, 527, 532, 676.
 Busvine, J. R., 654.
 Butler, F. M., 226.
 Butler, L. I., 585.
 Butler, R. L., Jr., 815.
 Butt, H. R., 565.
 Buttolph, L. J., 444.
 Butz, E. L., 841.
 Butz, M., 864.
 Byer, A. C., 462.
 Byerly, T. C., 88, 377, 472.
 Byers, J. B., 722.
 Byrd, H. C., 144.
 Byrom, M. H., 42, 105, 106, 328.
 Cain, J. C., 335.
 Cain, R. F., 338.
 Calahan, C. L., 331.
 Caldwell, J., 644.
 Caldwell, J. S., 222.
 Caldwell, O. G., 801.
 Caldwell, R. M., 207.
 Call, L. E., 143, 719.
 Callaway, H. P., 682.
 Callaway, R. P., 120, 143.
 Callow, D., 600.
 Calvery, H. O., 853.
 Cámara, A., 180.
 Camargo, F. C., 25.
 Cameron, A. M., 500, 678.
 Cameron, E. J., 586.
 Cameron, G. D. W., 885.
 Cameron, H., 722.
 Cameron, J. W., 177.
 Camillo, L. J., 295, 850.
 Camp, A. F., 19.
 Camp, L. M., 41.
 Camp, W. H., 467.
 Campau, E. J., 657.
 Campbell, F. L., 221.
 Campbell, H. A., 818.
 Campbell, I. L., 91.
 Campbell, J., 84.
 Campbell, J. A., 232, 722.
 Campbell, J. C., 64.
 Campbell, J. D., 288.
 Campbell, J. J. R., 91.
 Campbell, R. E., 79.
 Campbell, T., 860.
 Campbell, W. A., 650.
 Campl, M. D., 649.
 Canada, T. L., 428.
 Canfield, R. H., 620.
 Canning, J. B., 393.
 Cannon, C. Y., 521, 680, 809, 810.
 Canon, H., 718.
 Card, C. G., 670, 800.
 Card, L. E., 377.
 Carleton, E. A., 18.
 Carlson, E. C., 369.
 Carlson, F. W., 72, 498.
 Carlson, W. E., 248, 624.
 Carlton, H., 158, 272.
 Carpenter, C. C., 28, 705.
 Carpenter, C. D., 377.
 Carpenter, J. B., 345, 357.
 Carpenter, R. W., 687.
 Carpenter, S. J., 370, 662.
 Carr, H. L., 261.
 Carrocker, J. R., 164, 184.
 Carrera, C. J. M., 488.
 Carrero, J. O., 579.
 Carrick, C. W., 376, 378, 518.
 Carrigan, R. A., 19.
 Carroll, J. C., 169.
 Carroll, W. E., 513.
 Carruth, L. A., 785.
 Carruthers, C., 735.
 Carsner, E., 619.
 Carter, C. W., 84.
 Carter, D. G., 15, 109, 261, 393.
 Carter, H. B., 799.
 Carter, L. S., 596.
 Carter, R. H., 499.
 Cartwright, K. St. G., 70, 781.
 Carver, G. W., 427.
 Carver, J. S., 236, 377, 517, 805.
 Cary, C. A., 90, 670.
 Casanges, A. H., 505.
 Case, H. C. M., 401.
 Cash, E. K., 359.
 Casida, L. E., 183, 610.
 Caspari, E., 182.
 Cass Smith, W. P., 209.
 Casselberry, N. H., 245, 814.
 Casselberry, R. D., 652.
 Cassil, C. C., 50, 72, 80.
 Castell, C. H., 294, 382.
 Caster, A. B., 451.
 Castillo V. A., 310.
 Castle, H., 496.
 Cathcart, W. H., 408, 409.
 Cation, D., 68, 215, 777.
 Cattell, J., 130, 315, 469.
 Caulfield, W. J., 671, 812.
 Cauthen, G. E., 680.
 Cave, H. W., 671.
 Cave, M. S., 465.
 Cavert, W. L., 693.
 Cawley, J. D., 707.
 Cayton, E. E., 645.
 Cederquist, D., 549, 701.
 Celmer, R. F., 442.
 Cerecedo, L. R., 859.
 Chace, W. G., 286.
 Chadwick, L. C., 46.
 Chaffee, E., 388.
 Chaffin, A. D., Jr., 392.
 Chaikoff, I. L., 726.
 Chain, E., 172, 600.
 Chamberlain, D. W., 640.
 Chamberlin, F. S., 498, 504.
 Chamberlin, H. H., 499.
 Chamberlin, V. D., 285, 378, 516.
 Chambers, W. H., 410.
 Chandler, C., 181.
 Chandler, F. B., 195, 196.
 Chandler, J. M., 263.
 Chandler, J. P., 581.
 Chandler, R. F., Jr., 17, 498.
 Chandler, W. H., 631.
 Chang, M. C., 615.
 Chapman, A. J., 73.
 Chapman, G. L., 56.
 Chapman, H. D., 198.
 Chapman, H. H., 56, 639.
 Chapman, P. J., 220, 363, 785.
 Chapman, R. A., 591.
 Chapman, V. J., 601.
 Chapple, C. C., 444.
 Charles, D. R., 746.
 Charles, T. B., 235.
 Charley, H., 129, 559.
 Charter, H. E., 30.
 Chase, H. B., 320.
 Chase, S. B., 637.
 Cheldelin, V. H., 733.
 Chen (Chan), S. Y., 647.
 Chen, T.-T., 317.
 Cheremisova, V., 738.
 Cherian, M. C., 793.
 Chester, K. S., 202, 203.
 Cheyne, V. D., 567.
 Cheyney, E. G., 638.
 Chidester, M. S., 216.
 Childers, N. F., 213, 503, 632.
 Childs, E. C., 160.
 Childs, W. H., 53.
 Chilton, S. J. P., 484, 608, 769, 770.
 Chin, T. C., 38.
 Chinn, H., 413.
 Chisholm, R. D., 782.
 Chittick, R. A., 562.
 Chitwood, B. G., 202.
 Chornock, C., 277, 554.
 Chou, C.-Y., 581.
 Chow, B. F., 38, 39.
 Christ, E. G., 632.
 Christensen, B. E., 731.
 Christensen, C. L., 144.
 Christensen, C. M., 27.
 Christensen, J. F., 98.

- Christensen, J. J., 444.
 Christensen, N. A., 144, 427.
 Christenson, R. O., 531, 815.
 Christie, A. W., 409.
 Chuinard, E. G., 278.
 Chupp, C., 66.
 Church, J. E., 14, 300, 445, 736.
 Claassen, C. E., 609.
 Clague, J. A., 11, 150.
 Clandinin, D. R., 804.
 Clapp, A. L., 484, 579, 618.
 Clapp, J., 543.
 Clare, S., 385.
 Clarenbach, F. A., 693.
 Clark, B. E., 191.
 Clark, C. F., 64, 90, 91, 351.
 Clark, C. H., 814.
 Clark, C. K., 198.
 Clark, E. D., 700.
 Clark, F. E., 61, 347.
 Clark, G. R., 587.
 Clark, H. C., 218, 662.
 Clark, J. H., 52.
 Clark, N., 144.
 Clark, R. T., 181, 514, 667, 720.
 Clark, T. B., 377.
 Clark, T. F., 726.
 Clark, W. K., Jr., 361.
 Clark, W. W., 143, 144.
 Clarke, M. F., 417.
 Clarke, W. S., Jr., 628.
 Clausen, C. P., 499.
 Clausen, S. W., 855.
 Clawson, M., 693.
 Claydon, T. J., 96, 797, 807.
 Clayton, C. N., 346.
 Clayton, E. E., 346, 774.
 Clayton, H. G., 19.
 Clayton, H. H., 593.
 Clayton, M. M., 144.
 Clayton, M. W., 144.
 Clegg, J. W., 731.
 Clement, R. L., 202.
 Clement, S. L., 400, 402.
 Clendenin, J. C., 536.
 Clevenger, J. F., 586.
 Climenko, D. R., 673.
 Clinch, J. B., 92, 520.
 Clinch, P. E. M., 643, 644.
 Cline, A. C., 483.
 Cline, J. A., 127.
 Cline, B. A., 429.
 Clisby, K. H., 412.
 Clore, W. J., 191.
 Clough, N., 110.
 Clyde, A. W., 688.
 Coblentz, W. W., 444.
 Cochran, H. L., 185, 477, 855.
 Cockerill, P. W., 837.
 Coco, B. M., 751.
 Coffey, J. S., 372.
 Coffey, W. C., 2.
 Coffman, F. A., 484.
 Cohen, J. G., 139.
 Cohen, M., 367.
 Cohen, S. S., 346, 352, 647.
 Cohn, G., 290.
 Coile, T. S., 302.
 Colcord, M., 498.
 Coldwell, A. E., 453.
 Cole, A. C., Jr., 664.
 Cole, C. L., 187, 468, 668.
 Cole, E. C., 578.
 Cole, R. K., 377, 749.
 Cole, T. W., 97.
 Coleman, O. T., 454.
 Coleman, R., 41, 453, 454, 599, 618.
 Coles, E. H., 618.
 Colhoun, J., 350.
 Collier, H. B., 530.
 Collins, C. W., 782.
 Collins, D. L., 782.
 Collins, E. R., 185, 340, 453.
 Collins, R. F., 324.
 Collins, R. W., 377.
 Colom, J. L., 576.
 Colquhoun, M. K., 360.
 Colquhoun, T. T., 776.
 Colwell, R. N., 744.
 Comar, C. L., 464, 731.
 Comfort, J. E., 84.
 Comin, D., 260.
 Common, R. H., 374.
 Commoner, B., 602.
 Commons, J. R., 393.
 Compton, L. E., 207.
 Comstock, R. E., 181, 184, 516, 610.
 Condit, G. R., 201.
 Condit, I. V., 199.
 Condliffe, J. B., 393.
 Cone, J. F., 92, 812.
 Conklin, J. G., 511.
 Conn, G. H., 243.
 Conn, H. J., 175, 305, 457, 599, 607.
 Conn, J. E., 310.
 Connel, W. E., 721.
 Connelly, J. W., 384.
 Conner, A. B., 142.
 Conner, M. C., 836.
 Connola, D. P., 782.
 Connor, A. J., 15.
 Connor, M. L., 538, 539.
 Conover, B., 652.
 Conover, L. F., 15.
 Conquest, V., 674.
 Conrad, C. M., 290.
 Conrad, E. C., 41.
 Conrad, H. H., 123.
 Conrad, J. P., 24, 598, 631.
 Conrad, R. M., 237, 614, 666.
 Conrad, V., 299.
 Conrat, H. Fraenkel, 471.
 Conrat, J. Fraenkel, 471.
 Conroy, H. W., 586.
 Converse, H. T., 375.
 Cook, A. C., 513.
 Cook, C. W., 298.
 Cook, H. T., 189, 488, 644.
 Cook, J. W., 517.
 Cook, O. F., 768.
 Cook, R. L., 168, 192.
 Cook, W. H., 516.
 Cooke, W. B., 601.
 Cooksey, H. L., 34.
 Cooley, J. S., 68, 214, 359.
 Cooley, R. A., 512, 664.
 Cooper, A. W., 828.
 Cooper, D. C., 178.
 Cooper, G. O., 465.
 Cooper, J. B., 46, 737, 762.
 Cooper, M. R., 111, 392.
 Cooper, T. P., 4.
 Cooper, W. E., 201.
 Cooper Smith, E., 143.
 Copeland, O. C., 92, 99.
 Copley, T. L., 252.
 Corbett, R. B., 144, 148, 687.
 Cordero Zagallo, A., 485.
 Cordner, H. B., 477.
 Corley, R. T., 92, 380.
 Cormack, M. W., 349.
 Cornman, I., 463.
 Correa de Mello, P., 168.
 Corum, C. J., 31.
 Cory, E. N., 782, 784.
 Cory, V. L., 25, 42, 85.
 Costa Lima, A. da, 783.
 Costello, D. F., 626, 756.
 Costigan, S. M., 104.
 Cottam, C., 217.
 Cottam, H. R., 143, 697, 844.
 Cotton, R. T., 221.
 Cotton, W. E., 523.
 Cotton, W. F., 268, 269.
 Cottral, G. E., 104.
 Couch, J. F., 97.
 Couch, J. H., 84.
 Coulter, S. T., 92.
 Court, A., 14.
 Coutant, F. R., 811.
 Coutinho, L. A., 180.
 Cover, S., 127.
 Coward, K. H., 284, 293.
 Cowart, F. F., 195, 634, 868.
 Cowgill, G. R., 284, 411.
 Cowgill, P. S., 300.
 Cowles, M. M., 143.
 Cowling, H., 685.
 Cox, A. J., 389.
 Cox, G., 275, 852, 853.
 Cox, J. A., 510.
 Cox, M. B., 164, 737.
 Cox, R. F., 666.
 Cox, R. P., 855.
 Cox, T. R., 167.
 Craig, G. F., 41.
 Craig, H. W., 384.
 Cralley, E. M., 59, 769.
 Crampton, E. W., 513, 668.
 Crandall, B. S., 58.
 Crandall, G. C., 806.
 Crandall, W. A., 706.

- Crane, J. C., 7, 53.
 Crasemann, E., 376.
 Cravens, W. W., 237, 802, 804.
 Crawford, A. B., 97.
 Creech, G. T., 97, 98.
 Creech, H. M., 536.
 Creel, H. H., 531, 815.
 Creel, R. H., 226.
 Cress, M., 342.
 Cressman, G. P., 14.
 Crisler, O. S., 99.
 Crocheron, B. H., 144.
 Crockett, S. P., 537, 798.
 Crolzat, L., 601.
 Cromer, C. O., 619.
 Crooks, D. M., 627.
 Crosier, W., 484, 771.
 Cross, F. B., 313, 861.
 Cross, W. E., 774, 867.
 Crow, R., 834.
 Crowdy, S. H., 494.
 Crowe, L. K., 95.
 Crowell, I. H., 344.
 Crown, R. M., 87, 232, 797.
 Cruess, W. V., 10, 11, 156,
 157, 158, 274, 295, 296,
 297, 409, 440, 441, 545,
 849, 850.
 Crumbaker, D. E., 428.
 Cullinan, F. P., 318.
 Cullison, A. E., 86, 537, 798.
 Culston, T. G., 378.
 Cumley, R. W., 37.
 Cummings, J. N., 610, 615.
 Cummings, M. B., 476, 485,
 506.
 Cummings, R. W., 5, 17.
 Cummins, G. B., 642.
 Cunha, T. J., 516.
 Cunningham, B., 752.
 Cunningham, I. J., 175.
 Cupples, H. L., 731.
 Cupps, P. T., 34.
 Curran, C. H., 663.
 Currence, T. M., 765.
 Currey, E. A., 52, 191, 325,
 479.
 Curtis, H. A., 143, 144.
 Curtis, J. T., 33.
 Curtis, L. C., 629.
 Curtis, O. F., Jr., 8.
 Cushing, E. C., 97, 98.
 Cushing, R. L., 41, 475.
 Cushman, E. M., 718.
 Cutler, G. H., 476, 762.
 Cutright, C. R., 512.
 Cutter, V. M., Jr., 310, 486,
 781.
 Cutuly, E., 184, 751.
 Cykler, J. F., 576.
 Dack, G. M., 409.
 da Costa Lima, A., 783.
 Daft, F. S., 526.
 Dahlberg, A. C., 92, 287, 521
 Dahle, C. D., 240, 671, 812.
 Dahms, R. G., 81, 783.
 Dailey, D. L., 610.
 Daines, L. L., 105.
 Daines, R. H., 64.
 Dale, C. N., 98, 390.
 Dale, L. W., 140.
 Dalke, P. D., 361.
 Dallimore, C. E., 59.
 Dalziel, C. F., 256.
 Dam, H., 152.
 Dameron, W. H., 35, 42, 84.
 Daniel, E. P., 559.
 Daniel, F. B., 693.
 Daniel, H. A., 737.
 Daniel, W. R., 122.
 Dann, M., 560.
 Dann, W. J., 547, 858.
 Darlington, C. D., 607.
 Darlow, A. E., 429.
 Darnell, A. L., 92, 99.
 Daroga, R. P., 293.
 Darrah, L. B., 262.
 Darrow, G. M., 52, 53, 467,
 481.
 Darrow, M. I., 377.
 Daubenmire, R. F., 30.
 Daugherty, M. M., 265.
 Davey, A. E., 338.
 Davinault, L., 229.
 David, W. A. L., 509, 662.
 Davidson, F. E., 618.
 Davidson, J. B., 108.
 Davidson, O. W., 634.
 Davidson, R. H., 370.
 Davidson, R. W., 359, 601.
 Davidson, W. F., 594.
 Davidson, W. M., 232.
 Davies, H. R., 625.
 Davis, A. M., 631.
 Davis, A. R., 170.
 Davis, C. L., 679.
 Davis, D. D., 217.
 Davis, D. H., 699.
 Davis, F. E., 621.
 Davis, G. B., 114, 839.
 Davis, G. K., 233.
 Davis, G. N., 49.
 Davis, G. T., 377.
 Davis, H. A., 241, 373, 454
 Davis, H. L., 422.
 Davis, H. P., 90, 105.
 Davis, J. F., 192.
 Davis, J. G., 811.
 Davis, J. S., 270, 536.
 Davis, K., 164.
 Davis, K. C., 261, 288.
 Davis, K. F., 55.
 Davis, L. D., 339.
 Davis, L. E., 452.
 Davis, L. L., 623.
 Davis, P. O., 144.
 Davis, R. O. E., 594.
 Davis, S. G., 11, 440, 544.
 Davis, S. P., 35, 84.
 Davis, W. A., 160.
 Davis, W. C., 269.
 Davison, E., 409.
 Davison, R. O., 385.
 Davison, W. C., 547.
 Dawson, E. R., 293.
 Dawson, M. H., 388.
 Dawson, R. F., 744.
 Dawson, W. M., 513.
 Day, A. A., 569.
 Day, E. E., 4.
 Day, L. H., 481.
 Day, P. R., 595.
 Deal, E. C., 586.
 de Almeida, F. J., 493.
 Deam, C. C., 310.
 Dean, F. J., 91.
 Dean, F. P., 80.
 Dean, G. A., 618, 628.
 Dean, L. A., 24.
 Dean, R. W., 363, 785.
 Deane, D. D., 92.
 Dearstyne, R. S., 376.
 Deaton, C. G., 537.
 De Bach, P., 499, 783.
 Debusk, E. F., 19.
 DeCaprio, A., 499.
 Decker, C. W., 5, 382.
 Decker, S. W., 618, 623, 628,
 693.
 DeEds, F., 220, 281, 389, 704.
 Deen, E., 330.
 Deeny, J., 735.
 Defalco, R. J., 391.
 DeFelice, D., 150, 151.
 DeFrance, J. A., 328.
 de Garcia Cabral, R. V., 493.
 Delnard, H. H., 549.
 Delaplane, J. P., 686.
 Delbrück, M., 430, 769.
 DeLoach, D. B., 121, 842.
 DeLong, D. M., 781, 782.
 de Lourdes d'Oliveira, M.,
 209.
 Demarce, J. D., 493.
 Dence, W. A., 217.
 DeNio, R. M., 245.
 Denison, F. C., 624.
 Denman, T. E., 47.
 Denning, J. A., 499.
 Dennis, R. W. G., 203.
 Denny, F. E., 44, 602.
 Denny, G. G., 863.
 Dennys, A. A., 369.
 Deonier, C. C., 72, 81, 226,
 408.
 DePuy, G. S., 141.
 Dermen, H., 467.
 DeRose, H. R., 288.
 Derrick, E. H., 244.
 deS. Brunner, E., 845.
 Descartes, S. L., 696.
 Deshpande, A. K., 611.
 Deslandes, J. A., 642, 773.
 de Sousa, M. C. F., 207.
 de Souza Lopes, H., 227.
 Deszyck, E. J., 667.
 DeTurk, E. E., 21, 23.

- Deuel, H. J., Jr., 137, 858.
 Deutsch, H. F., 584.
 DeVaughn, N. M., 418, 711.
 Devaux, L. A., 499.
 de Villiers, D. J. R., 714.
 Devore, G. G., 300.
 De Vos, D., 324.
 Deysher, E. F., 731.
 Diachun, S., 211, 457.
 Diamante, A., 520.
 Dibble, C. B., 295.
 Dice, J. R., 90, 720.
 Dick, A. T., 528.
 Dick, J., 658.
 Dick, J. B., 63.
 Dick, L. A., 677.
 Dickerman, M. B., 57.
 Dickerson, G. E., 610, 611.
 Dickey, H. C., 834.
 Dickey, R. D., 484, 767.
 Dickins, D., 142, 275, 409, 424, 718, 888.
 Dickinson, B. C., 782.
 Dickinson, E. M., 825.
 Dickman, S. R., 21.
 Dicks, E. E., 806.
 Dickson, A. D., 595.
 Dickson, H., 601.
 Dickson, J. G., 202, 349, 621.
 Dickson, R. C., 70, 780.
 Dickson, R. E., 42, 84.
 Didlake, M., 330.
 Dietz, C. F., 833.
 Di Fonzo, M. A., 208, 487, 643.
 Dikmans, G., 98, 384, 823.
 Diller, J. D., 780.
 Dillman, A. C., 488.
 Dillon, R. T., 588.
 Dimick, M. K., 558.
 Dimler, R. J., 725.
 Dimock, W. W., 814.
 Dimond, A. E., 778.
 Dinwiddle, W. K., 34.
 DiSomma, A. A., 173.
 Dittman, L. P., 782.
 Dittmer, K., 711.
 Dizikes, J. L., 127, 274.
 Doan, F. J., 127, 274, 671.
 Dobbs, C. G., 310.
 Dockins, J. O., 755.
 Dodds, P., 131.
 Dodge, B. O., 25.
 Doehlert, C. A., 657.
 Doering, K. C., 222.
 Dohanian, S. M., 79, 796.
 Doisy, E. A., 40.
 Dolby, R. M., 382.
 d'Oliveira, B., 207, 495.
 D'Oliveira, M. de L., 209, 495.
 Doll, R. J., 693.
 Donahue, R. L., 185.
 Donelson, E. G., 275.
 Doner, M. H., 219.
 Donnelly, E. B., 288.
 Donohoe, H. C., 783.
 Donovan, C. G., 586.
 Doolittle, S. P., 356.
 Doran, W. J., 65.
 Doran, W. L., 339, 631.
 Dorcas, M. J., 91.
 Dore, W. G., 209, 741.
 Dorman, C., 41, 144, 151, 159, 186, 191, 203, 218, 230, 238, 300, 325, 331, 342, 354.
 Dorn, F. L., 92.
 Dorsey, M. J., 196, 479.
 Dotter, M. J., 520.
 Doty, D. M., 575.
 Doucette, C. F., 74, 509.
 Doudoroff, M., 457.
 Dougherty, N. W., 144.
 Dougherty, R. W., 90, 681.
 Douglas, H. C., 310.
 Douglas, J. R., 85, 374.
 Douglass, J. R., 505.
 Dounce, A. L., 728.
 Dove, W. E., 371, 509, 657.
 Dow, D. J., 414.
 Dow, G. F., 398.
 Dowd, L. R., 813.
 Dowell, A. A., 304.
 Down, E. E., 188, 621, 759.
 Downes, W., 500.
 Downs, A. A., 483.
 Downs, C. M., 457.
 Downs, P. A., 95, 96, 105, 814.
 Dowson, W. J., 204.
 Doyle, L. P., 241.
 Doyle, M. E., 444.
 Doyle, T. M., 246.
 Dozier, E., Jr., 420.
 Drain, B. D., 627, 635.
 Drake, C. J., 366.
 Draper, C. I., 236, 807, 826.
 Dreby, E. C., 572.
 Dregne, H. E., 758.
 Dressel, P. L., 543.
 Drosdoff, M., 595, 649.
 Drummond, J. C., 130.
 Drummond, L. W., 143.
 Drummond, O. A., 491, 493.
 DuBois, A. S., 457.
 DuBois, C. W., 273, 868.
 DuBois, K. P., 589.
 Dubos, R. J., 583.
 du Buy, H. G., 210.
 Duckworth, C. U., 687.
 Dudley, F. J., 237.
 Duerr, W. A., 638.
 Duffee, F. W., 256.
 Dugas, A. L., 362, 509.
 Duggar, J. F., 185.
 Duley, F. L., 15, 24.
 Dumm, L. B., 428.
 Dummeler, E. F., 268, 536.
 Dunbar, C. O., 628.
 Duncan, C. W., 93, 238, 810.
 Duncan, E. N., 760.
 Duncan, I. J., 441.
 Duncan, J., 862.
 Duncan, R. E., 83.
 Dunford, E. G., 14, 843.
 Dungan, G. H., 475.
 Dunham, H. H., 40, 752.
 Dunkle, E. C., 628.
 Dunkle, P. B., 35, 42, 85.
 Dunkleberg, G. H., 180.
 Dunkley, W. L., 240.
 Dunlap, A. A., 50.
 Dunlop, G., 375.
 Dunn, C. G., 578.
 Dunn, H. O., 90, 91.
 Dunn, J. E., 657.
 Dunn, L. C., 36, 182.
 Dunne, T. C., 635.
 Durán M., L., 430.
 Durant, A. J., 99.
 Durgin, R. C., 235.
 Durham, O. C., 444.
 Duro, S., 242.
 Dutcher, R. A., 277, 377, 701.
 Dutky, S. R., 504.
 Du Toit, B. A., 231, 234, 375.
 du Vigneaud, V., 9, 581, 582, 702, 705, 711, 724, 726.
 Dyas, E. S., 622.
 Dye, M., 144, 550.
 Dyer, A. J., 84.
 Dykstra, R. R., 389, 523.
 Dykstra, T. P., 210, 488, 643.
 Eades, J., 356.
 Eagles, L. D., 184.
 Eagleson, C., 663.
 Eakin, R. E., 9.
 Earle, H. H., Jr., 815.
 Earle, I. P., 98, 800.
 Easley, T., 721.
 Eastman, N. J., 131.
 Eastwood, T. M., 763.
 Eaton, A. G., 241.
 Eaton, C. B., 227.
 Eaton, F. M., 59, 172, 314.
 Eaton, M. D., 525.
 Eaton, O. N., 610.
 Eaton, R. K., 869.
 Eaton, S. V., 172, 462, 773.
 Eaton, T. H., Jr., 361, 498.
 Ebbs, J. H., 410.
 Ebeling, W., 74.
 Eberle, A. M., 144.
 Eby, C., 187.
 Eckert, J. E., 83.
 Eckert, P. S., 264.
 Eckhardt, R. E., 283.
 Eddie, B., 251, 678, 686.
 Eddy, C. O., 362, 500.
 Eddy, G. W., 280, 498, 664.
 Edelblute, N., 275.
 Eden, A. B., 603.
 Eder, H., 727.
 Edgar, A. D., 691.
 Edgar, R., 140, 286.
 Edgerton, C. W., 211.
 Edgerton, L. J., 386, 632.
 Edgington, B. H., 103.
 Edlissen, N. E., 161, 162, 447, 448, 737.

Edman, G., 674.
 Edmond, J. B., 186.
 Edmondson, J. E., 91.
 Edsall, J. T., 149.
 Edwards, A. D., 124.
 Edwards, I. E., 429.
 Edwards, I. F., 513.
 Edwards, J. K., 317.
 Edwards, P. R., 251, 388, 526, 817.
 Edwards, S. J., 820.
 Efferson, J. N., 397.
 Eheart, J. F., 520.
 Eheart, M. S., 276.
 Ehrlich, J., 202, 290, 650.
 Eichhorn, A., 97, 98, 814, 825.
 Eichmann, R. D., 503.
 Eide, P. M., 509.
 Einset, J., 747.
 Eklund, C. R., 361.
 Ekstrom, V. A., 403.
 Elder, C., 99.
 Elder, W. H., 360.
 Elges, C., 300, 445.
 Elijah, H. D., 84.
 Ellenberger, H. B., 534.
 Ellenby, C., 209.
 Ellenwood, C. W., 50.
 Elliott, C., 772.
 Elliott, E. C., 2.
 Elliott, M. D., 412.
 Ellis, D. M., 278.
 Ellis, K., 428.
 Ellis, N. K., 48.
 Ellis, N. B., 97, 98, 513.
 Ellis, W. J., 29.
 Ellisor, L. O., 362.
 Ellis, V. R., 585.
 Elmer, O. H., 65, 351, 623.
 Elmore, J. C., 79, 368.
 Elrod, R. P., 599.
 Elsom, K. O., 553, 554.
 Elting, E. C., 808.
 Elton, C., 360.
 Elvehjem, C. A., 87, 136, 153, 274, 281, 416, 557, 565, 668, 669, 705, 854, 856, 859.
 Elving, P. J., 730.
 Elwell, H. M., 737.
 Ely, R. E., 90.
 Emerick, A. M., 226.
 Emerson, B., 184.
 Emik, L. O., 513.
 Emlen, J. T., Jr., 322.
 Emmel, M. W., 100, 244, 250, 526.
 Emmens, C. W., 183.
 Emmert, E. M., 484, 765.
 Emmett, P. H., 149.
 Emminger, A. C., 818.
 Emmons, C. W., 391, 524, 823.
 Emslie, J. W., 820.
 Ende, M. Van Den, 445.
 Engel, C., 715.
 Engel, B. W., 433, 554, 555.
 Engelbreth-Holm, J., 523.

Enger, M. L., 4, 144.
 Engler, K., 106, 883.
 Engstrom, H. E., 200.
 Enke, S., 536, 698.
 Ensminger, L. E., 455.
 Ensminger, M. E., 513, 847.
 Enzie, W. D., 764, 869.
 Epps, J. M., 348.
 Epstein, E., 631.
 Erb, J. H., 92, 241, 520, 675.
 Erb, R. E., 38, 614.
 Erdman, H. E., 112.
 Erdman, R. L., 304.
 Erhart, A. B., 618.
 Erickson, S. E., 147.
 Errington, B. J., 103.
 Esau, K., 747.
 Espe, D., 521, 680.
 Espe, D. L., 809.
 Esplin, A. L., 834.
 Esseen, W. B., Jr., 156, 288, 297, 441, 544, 862.
 Essig, E. O., 499, 781.
 Esturonne, D., 416.
 Etchells, J. E., 295.
 Etchells, J. L., 155.
 Etheredge, M. P., 585.
 Evans, A. C., 367, 654.
 Evans, C. A., 248.
 Evans, C. D., 724.
 Evans, D., 538.
 Evans, E. A., Jr., 705.
 Evans, H., 603.
 Evans, H. M., 39, 183, 471, 616.
 Evans, J. A., 363.
 Evans, M., 143.
 Evans, R. J., 237, 377, 805, 807, 826.
 Eveleth, D. F., 243, 390, 678, 821.
 Eveleth, M. W., 821.
 Evenari, M., 174.
 Everson, G., 410.
 Everson, L. E., 186.
 Ewan, M. A., 428.
 Ewing, H. E., 663, 665, 796.
 Ewing, H. E., Jr., 101.
 Ewing, K. P., 501.
 Exner, B., 770.
 Eyer, J. R., 78, 504.
 Eyles, D. E., 370.
 Eyring, H., 149.
 Ezekiel, M., 393.
 Ezekiel, W. N., 59, 484.
 Ezell, B. D., 480.
 Fabian, F. W., 10, 177, 295, 382, 520, 850.
 Fagan, F. N., 628.
 Fahey, J. E., 364.
 Fairbank, J. P., 476.
 Fairbanks, B. W., 513, 518.
 Faith, J. W., 428.
 Falconer, J. I., 110, 264, 394, 537, 837.

Fales, J. H., 220, 222, 370, 782.
 Falk, K. G., 707.
 Fallscheer, H., 575.
 Farish, L. R., 49, 332, 629.
 Farley, H., 389, 676, 678.
 Farmer, C. J., 715.
 Farner, D. S., 236, 803.
 Farnsworth, R. B., 16.
 Farquharson, J., 102.
 Farr, M. M., 531, 826.
 Farrall, A. W., 520.
 Farrar, C. L., 604.
 Farrar, J. L., 312.
 Farrar, M. D., 502, 784.
 Farrell, M. A., 682.
 Faulkner, E. K., 234.
 Faville, D. E., 536.
 Fedde, M. S., 144, 147.
 Fedorova, N. J., 773.
 Feeney, R. E., 412.
 Feingold, R. H., 382.
 Feller, A. E., 551.
 Fellers, C. R., 11, 156, 277, 297, 377, 441, 459, 846.
 Fellows, H. C., 626.
 Fels, S. S., 139.
 Felt, E. P., 498, 782.
 Felton, M. W., 59.
 Fenne, S. R., 343, 640.
 Fenske, M. R., 175.
 Fenstermacher, R., 683.
 Fenton, F., 273.
 Fenton, F. A., 81, 228.
 Fenton, F. C., 259, 688.
 Ferguson, C. E., 15.
 Ferguson, J. H., 14.
 Ferguson, L. C., 678.
 Ferguson, O. J., 4.
 Ferguson, W., 55.
 Fernald, H. T., 361.
 Fernando, M., 485, 779.
 Fernholz, D. L., 199.
 Ferrin, E. F., 513.
 Ferris, C. A., 788.
 Ferris, E. B., 537, 798.
 Ferris, G. F., 499.
 Fessenden, G. R., 5.
 Feustel, I. C., 738.
 Fick, H. A., 667.
 Field, J. T., 586.
 Fifield, C. C., 626.
 Figge, F. H. J., 284.
 Filling, G. A., 628, 848.
 Filipe de Sousa, M. C., 207.
 Filippello, F., 296.
 Finch, V. C., 443.
 Fincke, M. L., 560.
 Findlay, W. P. K., 781.
 Fine, L. O., 22.
 Finerty, J. C., 39.
 Fink, D. S., 575.
 Finland, M., 444.
 Finn, R. F., 56, 57.
 Finney, D. J., 367.
 Finney, K. F., 625.

- Fischer, G. W., 62.
 Fischer, H. E., 467.
 Fischer, J. B., 811.
 Fisher, C. D., 11, 154.
 Fisher, D. F., 51.
 Fisher, D. V., 51, 337.
 Fisher, E. G., 29.
 Fisher, H. J., 127.
 Fisher, M. L., 428.
 Fisher, P. J., 310.
 Fisher, R. A., 365.
 Fisher, R. C., 634.
 Fisher, W. S., 228.
 Fister, L. A., 635.
 Fitelson, J., 586.
 Fitts, J. W., 15.
 Fitzgerald, J. S., 217.
 Fitzpatrick, H. M., 311.
 Fladness, S. O., 97.
 Flanders, S. E., 72, 362, 504, 511, 790, 796.
 Fleisher, G., 388.
 Fleming, C. E., 233.
 Flenner, A. L., 206, 526.
 Fletcher, F. W., 656, 783.
 Fletcher, H. M., 140, 717, 866.
 Fletcher, J. E., 737.
 Fletcher, R. K., 73.
 Fletcher, S. W., 143, 720.
 Flint, L. H., 607.
 Flint, W. P., 502.
 Flock, E. V., 802.
 Flood, A. F., 528.
 Florey, H. W., 172, 600.
 Flory, E. L., 756.
 Flory, W. S., Jr., 47, 484.
 Floyd, E. H., 362, 500, 502.
 Floyd, W. W., 860.
 Fogg, G. E., 312.
 Foister, C. E., 203.
 Folley, S. J., 470.
 Follis, R. H., Jr., 684, 799.
 Folsom, D., 488, 643.
 Foltz, V. D., 309, 876.
 Fontenot, J. A., 361.
 Foot, A. S., 234, 376.
 Forbes, J. C., 136.
 Ford, J. H., 500.
 Ford, O. W., 7.
 Forsling, C. L., 768.
 Forster, G. W., 538, 694.
 Fortmann, K., 5.
 Fosberg, F. R., 461.
 Foster, A. O., 97, 528.
 Foster, H. H., 722.
 Foster, J. E., 115, 797.
 Foster, W. A., 393.
 Foster, W. C., 430.
 Fourcade, H. G., 158.
 Fournelle, H. J., 96.
 Fourt, L., 571.
 Fouts, E. L., 96, 808, 814.
 Fowler, R. H., 722.
 Fowler, T. E., 50.
 Fowler, W. M., 411.
 Fox, D. L., 310.
 Fox, H., 623.
 Fox, I., 509, 663.
 Fox, K. R., 285.
 Foy, J. R., 859.
 Fraenkel-Conrat, H., 471.
 Fraenkel-Conrat, J., 471.
 Fram, H., 862.
 Frame, B. H., 110.
 Frame, N. T., 542.
 Frampton, V. L., 61, 430, 646.
 France, R. L., 288.
 Francioni, J. B., Jr., 797.
 Francis, F. C., 513.
 Francis, T., Jr., 68, 251, 551.
 Frank, A. H., 97.
 Frank, E. R., 383.
 Frank, R. T., 184.
 Frankenbach, R. F., 320.
 Frankenberg, G. B., 865.
 Franklin, M. C., 797.
 Frankston, J. E., 730.
 Franzke, C. J., 186.
 Fraps, G. S., 15, 21, 38, 42, 84, 92, 127, 373, 438, 551, 599, 731, 798, 860.
 Fraps, R. M., 377, 751.
 Frary, G. G., 585.
 Fraser, F. C., 750.
 Fraser, L., 245, 494, 648.
 Fraser, L. D., 234.
 Fratzke, W. E., 603.
 Frayer, J. M., 381.
 Frazier, J. C., 618.
 Frazier, W. C., 91, 96, 380.
 Frear, D. E. H., 652, 657.
 Free, G. R., 829.
 Freeborn, S. B., 220.
 Freeman, M. E., 288, 430.
 Freeman, T. R., 807.
 Freeman, V. A., 668.
 Freeman, W. H., 755.
 French, A. P., 480.
 French, B. W., 235.
 French, C. E., 132, 143, 558.
 Frey, C. N., 293, 430, 857.
 Frezzi, M. J., 358, 360.
 Friar, H. F., 274, 295, 850.
 Fried, K., 330.
 Friedemann, T. E., 569.
 Friedlander, E. W., 28, 705.
 Friedman, B. A., 68, 649.
 Friedman, T. E., 280.
 Friend, R. B., 499.
 Friend, W. H., 42, 47.
 Friley, C. E., 144.
 Frischknecht, C., 235.
 Frison, T. H., 499, 658.
 Fritsch, F. E., 602.
 Fritz, C. W., 216.
 Fritz, J. C., 89, 877.
 Fritz, R. F., 510, 655.
 Fröler, K., 35.
 Frolow, S., 159.
 Fronk, W. D., 783.
 Frost, H. B., 749.
 Frost, S. W., 218.
 Frye, J. B., Jr., 810.
 Fryer, H. C., 36.
 Fryer, J. C. F., 367.
 Fudge, B. R., 197, 494.
 Fudge, J. F., 21, 798.
 Fuller, F. D., 373.
 Fuller, G. R., 85, 84, 92.
 Fuller, H. L., 517.
 Fuller, J. E., 675.
 Fuller, S. A., 826.
 Fullilove, W. T., 538, 836.
 Fulmer, E. I., 431.
 Fulton, B. B., 510.
 Fulton, C. O., 806.
 Fulton, R. A., 72, 787.
 Funchess, M. J., 144.
 Funk, E. M., 34, 72, 84, 806.
 Furniss, R. L., 791.
 Furry, M. S., 286.
 Furth, J., 523.
 Futral, J. G., 739.
 Gabbard, L. P., 106, 111.
 Gaddis, C. H., 783.
 Gacssler, W. G., 48.
 Gage, C. E., 403.
 Gahan, J. B., 503.
 Gaines, E. F., 609.
 Gaines, J. C., Jr., 73, 218.
 Gaines, R. C., 362, 363, 368.
 Gainey, P. L., 595.
 Galbraith, H., 846.
 Gallardo, G. A., 159.
 Gallia, F., 390.
 Gallup, W. D., 90, 519.
 Gambrell, F. L., 785.
 Garard, I. D., 585.
 Garcia Rada, G., 487.
 Gardner, F. E., 190.
 Gardner, H. H., 737.
 Gardner, J., 429.
 Gardner, J. L., 596.
 Gardner, R., 738.
 Gardner, V. R., 50, 765.
 Gardner, W. U., 38, 321.
 Garin, A. N., 106.
 Garman, P., 499.
 Garner, W. W., 616.
 Garren, K. H., 868.
 Garrett, O. F., 90, 91, 92, 797.
 Garrett, S. D., 348.
 Garrigus, U. S., 234.
 Garrigus, W. P., 514.
 Garrison, C. S., 43.
 Garrison, E. R., 5, 91, 92, 585.
 Garrison, G. L., 362, 368.
 Garrison, O. B., 627.
 Garver, S., 41.
 Gaston, H. P., 695.
 Gauch, H. G., 172.
 Gauthier, G., 782.
 Gavin, G., 555.
 Gay, F. J., 217.
 Geddes, M., 701.
 Geddes, W. F., 431.
 Gee, W., 405.
 Gehm, H. W., 738.
 Geiger, J. C., 409.
 Geiger, W. B., 421.

- Geiser, S. W., 460.
 Gellhorn, E., 130.
 Gelpi, A. J., 807.
 Georgi, C. E., 457.
 Gerdes, F. L., 43.
 Gerhardt, F., 480.
 Gericke, A. M., 670.
 Gershon-Cohen, J., 139.
 Gershoy, A., 468.
 Getz, H. R., 282.
 Gibbons, N. E., 516, 806.
 Gibbs, H. F., 38.
 Gibson, C. A., 813.
 Gibson, D. L., 125.
 Giese, A. C., 33.
 Gieseke, L. F., 399.
 Gifford, R., 243, 390, 678, 821.
 Gifford, W., 34, 243, 807.
 Gilbert, B. E., 147, 426.
 Gilbert, B. L., 674.
 Gilbert, R. W., Jr., 667.
 Gilbert, S. G., 52.
 Gile, P. L., 738.
 Gilles, N., 746.
 Gilgut, C. J., 65.
 Gillette, L. A., 579.
 Gilliland, J. R., 295.
 Gillis, M. B., 377.
 Giltner, L. T., 97, 98, 246, 683.
 Giltner, W., 814.
 Gilyard, A. T., 244.
 Gilyard, R., 244.
 Ginsburg, J. M., 782.
 Girton, R. E., 316.
 Gish, P. T., 185.
 Givan, C. V., 252.
 Gjessing, E. C., 430.
 Gjullin, C. M., 886.
 Glading, B., 251.
 Gladwin, H. S., 316, 317.
 Glasgow, H., 503, 785.
 Glazebrook, A. J., 419.
 Gleissner, B. D., 652.
 Glick, D., 750.
 Glick, P. A., 444.
 Glock, W. S., 29, 170.
 Gluecksohn-Schoenheimer, S., 36.
 Glynn, M. D., 772.
 Gnagy, M. J., 586.
 Goates, R., 451.
 Gobell, A. R., 511.
 Goddard, M. K., 143.
 Goddard, V. R., 570.
 Godfrey, G. H., 42, 59.
 Gold, H., 815.
 Goldberg, L., 418.
 Golding, N. S., 240.
 Goldston, E. F., 302.
 Gomez, E. T., 90, 91, 754.
 Gómez, L. A., 198, 628.
 Gomoljako, L. J., 855.
 Gonzalez Gallardo, A., 159.
 Gonzenbach, C., 315.
 Good, C. M., Jr., 612.
 Goodale, H. D., 469, 749.
 Goodbrand, N., 422.
 Goodell, B. C., 300.
 Goodhart, R., 280, 565.
 Goodhue, L. D., 220, 370, 657.
 Goodpasture, E. W., 818.
 Goodspeed, T. H., 25.
 Goodwin, M. H., Jr., 370, 662.
 Goodwin, R. C., 532.
 Goodwin, R. H., 747.
 Gorczynski, W., 14.
 Gordon, C. D., 377.
 Gordon, E. S., 564, 705.
 Gordon, M., 749.
 Gordon, R. F., 826.
 Gordon, S., 752.
 Gordon, S. A., 213.
 Gordon, W. R., 263, 429.
 Goresline, H. E., 295, 586.
 Gorham, A. T., 415.
 Gorham, R. P., 223, 658.
 Gorman, J. A., 181.
 Gorrell, F. L., 543.
 Gortner, R. A., 288.
 Gortner, W. A., 732.
 Goss, R. W., 41, 59, 352.
 Gossard, A. C., 627, 778.
 Gottlieb, D., 776.
 Gough, H. C., 367, 654.
 Gould, B. S., 569, 770.
 Gould, E., 50, 225.
 Gould, G. E., 222.
 Gould, I. A., 674.
 Gowen, J. W., 36, 318, 472, 599, 612, 749.
 Grace, N. H., 312.
 Graessle, O. E., 815.
 Graham, E., 497.
 Graham, E. R., 15.
 Graham, J. J. T., 586.
 Graham, L. T., 792.
 Graham, M. N., 700.
 Graham, O. H., 499.
 Graham, T. W., 203.
 Grall, G. F., 703.
 Grandfield, C. O., 618.
 Granger, W., 615.
 Grant, C. W., 29, 309.
 Grau, C. R., 801.
 Graves, A. H., 610.
 Graves, R. B., 670.
 Gray, E. L., 707.
 Gray, G. F., 54.
 Gray, H. F., 226.
 Grayson, J. M., 782.
 Greathouse, G. A., 716.
 Green, A. W., 696.
 Green, E. L., 749.
 Green, F. M., 765.
 Green, R. G., 247, 248, 823.
 Green, R. H., 816.
 Green, R. M., 144.
 Green, W. W., 181, 184.
 Greenbank, G. R., 433.
 Greenberg, B., 444.
 Greenberg, J., 682.
 Greenberg, L. A., 130.
 Greene, C. A., 50.
 Greene, D., 444.
 Greene, J. W., 579.
 Greene, R. E. L., 394.
 Greene, R. R., 39, 321.
 Greenfield, S. S., 173.
 Greenlaw, J. P., 693.
 Greenspan, L., 444.
 Greenwood, A. W., 321.
 Greenwood, D. E., 785.
 Greep, R. O., 36, 38, 39.
 Greer, S. R., 627.
 Greer, W., 428.
 Gregory, D. W., 824.
 Gregory, P. W., 611.
 Gregson, J. D., 230, 500.
 Greig, J. R., 529.
 Greulach, V. A., 32.
 Grey, C. G., 98, 390.
 Griffith, E. L., 440.
 Griffith, W. H., 133, 279, 705.
 Griffiths, A. E., 192, 763.
 Griffiths, J. T., Jr., 221, 502.
 Griffiths, S. D., 371.
 Griggs, R. F., 416.
 Griggs, W. H., 47, 335.
 Grigsby, H. D., 586.
 Grimes, M. A., 140.
 Grimes, W. E., 399, 693, 719.
 Grizzard, A. L., 185, 620, 625.
 Grober, S., 461.
 Grondal, B. L., 780.
 Grundmann, A. W., 510.
 Grüneberg, H., 612.
 Guard, A. T., 347.
 Guba, E. F., 40, 65.
 Guerrant, N. B., 95, 277, 701.
 Guest, I., 636.
 Guest, P. L., 722.
 Gui, H. L., 219.
 Guilbert, H. R., 515.
 Guilford, H. M., 814.
 Guillou, R., 534.
 Guin, M., 269, 536.
 Guirard, B. M., 712.
 Guiscafé-Arrillaga, J., 198, 628.
 Gull, P. W., 41, 618.
 Gunn, R. M. C., 615.
 Gunness, C. J., 196, 594.
 Gunsalus, I. C., 458, 600.
 Gunselman, M. A., 719.
 Gunther, F. A., 72, 74, 783.
 Gussow, H. T., 644.
 Gustafson, F. G., 49, 317.
 Gustafsson, A., 35.
 Guterman, C. E. F., 144, 147.
 Guthrie, E. S., 7, 91, 92.
 Gutowska, M. S., 377.
 Gutteridge, H. S., 37, 88, 320.
 Guyton, F. E., 72.
 Gwatkin, R., 100, 102, 386.
 Gwynne, C. S., 302.
 György, P., 283, 417, 705, 711.
 Gysel, L. W., 597.
 Haag, J. R., 90.

- Haas, H. F., 26.
 Haas, H. J., 618.
 Haasis, F. A., 495.
 Haber, E. S., 48.
 Haddow, J. R., 249.
 Haddow, W. R., 651.
 Hadsell, R. S., 401.
 Hadwen, S., 86.
 Haenni, E. O., 585.
 Haenseler, C. M., 640.
 Hafer, L. F., 594.
 Hagan, W. A., 814.
 Hagborg, W. A. F., 348.
 Hageman, R. H., 193, 456, 487, 585, 645.
 Haggard, H. H., 130.
 Hagmann, L. E., 782.
 Hagood, A. F., 867.
 Hahn, B. E., 306.
 Hahn, G. G., 779.
 Haig, C., 282, 552.
 Haigh, L. D., 585.
 Hainsworth, R. G., 261.
 Halcrow, H. G., 429.
 Hale, F., 35, 84.
 Hall, V. E., 409.
 Hall, E. R., 652.
 Hall, H. H., 806.
 Hall, I. C., 291.
 Hall, J. L., 666.
 Hall, O. J., 270.
 Hall, R. A., 47, 84, 86.
 Hall, R. T., 57.
 Hall, S. R., 91, 375.
 Hall, W. J., 98, 104, 825.
 Hallauer, F. J., 830.
 Haller, H. L., 498.
 Haller, M. H., 50, 51.
 Halliday, D., 727.
 Halliday, E. G., 487, 559.
 Halliday, N., 137.
 Hallin, W., 201.
 Hallman, E. T., 100.
 Hallmark, R. B., 514.
 Hallock, H. C., 306.
 Halloran, H. R., 377.
 Hallqvist, C., 612.
 Hallsted, A. L., 618.
 Halma, F. F., 54.
 Halnan, E. T., 378, 546.
 Halpin, J. G., 237, 248, 802, 804.
 Halpin, J. L., 377.
 Halpin, R. B., 235.
 Halversen, W. V., 106.
 Ham, W. E., 84.
 Hamblidge, G., 97.
 Hamburger, V., 469.
 Hamilton, C. C., 781.
 Hamilton, C. L., 107.
 Hamilton, D. W., 785.
 Hamilton, H. L., 410.
 Hamilton, J. M., 206.
 Hamilton, J. W., 549.
 Hamilton, P., 588.
 Hamilton, T. S., 128, 231, 374, 518.
 Hamm, W. S., 236.
 Hammar, C. H., 110, 112, 113.
 Hammar, H. E., 778.
 Hammer, B. W., 92.
 Hammer, O. B., 363.
 Hammers, E. V., 376.
 Hammon, W. M., 226, 385, 386, 816.
 Hammond, D. M., 820.
 Hammond, J. C., 236, 377, 517, 518, 753.
 Hammond, J., 616, 796.
 Hammond, J., Jr., 616.
 Hamner, C. L., 462, 560.
 Hamner, K. C., 544, 560.
 Hamner, R. J., 847.
 Hamre, C. J., 88, 548.
 Hand, I. F., 14.
 Handler, P., 858.
 Hankins, O. G., 181, 513.
 Hankinson, C. L., 92, 813.
 Hanna, C. G., 855.
 Hanna, G. C., 332, 546.
 Hannay, A. M., 111.
 Hansberry, R., 792.
 Hansen, D., 618, 666.
 Hansen, E. L., 800.
 Hansen, W. J., 841.
 Hansing, E. D., 61.
 Hanson, A. M., 455.
 Hanson, F. E., 92, 807.
 Hanson, L. E., 84.
 Hanson, N. S., 41.
 Harding, E. R., 407.
 Hardison, J. R., 62, 429, 772.
 Hardman, G., 301.
 Hardt, L. L., 137.
 Hardy, G. A., 500.
 Hardy, J. L., 140, 423, 513.
 Hardy, W. T., 99.
 Hare, J., 484.
 Harkom, J. F., 254.
 Harlan, C. L., 694.
 Harlan, H. V., 621.
 Harlan, J. D., 332.
 Harlow, W. M., 200.
 Harman, M. T., 701.
 Harman, S. W., 363, 785.
 Harms, A., 377, 805.
 Harmston, F. C., 217, 226.
 Harper, C., 799.
 Harper, E. B., 125.
 Harper, J. A., 376.
 Harrar, J. G., 575.
 Harrel, C. G., 151, 152.
 Harrelson, J. W., 144.
 Harrington, F. M., 64, 618, 628.
 Harris, C. M., 269.
 Harris, G. C. M., 601.
 Harris, H. M., 783.
 Harris, J. A., 288.
 Harris, J. W., 144.
 Harris, K. L., 656.
 Harris, K. W., 699.
 Harris, L., 41.
 Harris, M., 421, 571, 864.
 Harris, M. R., 650.
 Harris, P. L., 438.
 Harris, R. H., 298, 626.
 Harris, R. S., 592.
 Harris, S. K., 460.
 Harrison, A. L., 59.
 Harrison, C. H., 497.
 Harrison, C. M., 187, 667.
 Harrison, E., 667.
 Harrison, F., 143.
 Harrison, J. A., 173.
 Harrison, R. W., 236.
 Harrison, T. R., 807.
 Harshaw, H. M., 377.
 Harshaw, M. M., 700.
 Hart, D., 444.
 Hart, E. B., 237, 667, 669, 802, 804, 853, 854.
 Hart, F. L., 585, 586.
 Hart, H., 486.
 Harter, L. L., 189.
 Hartman, A. M., 90.
 Hartman, E. L., 478.
 Hartman, F. O., 179.
 Hartman, G. H., 91, 92.
 Hartman, H., 767.
 Hartman, J. D., 477, 478, 479, 764.
 Hartsing, T. F., 626.
 Hartwig, E. E., 748.
 Hartwig, H. B., 758.
 Hartzell, A., 81, 656.
 Hartzell, F. Z., 363, 785, 786.
 Harvey, E. W., 456.
 Harwood, P. D., 96.
 Harwood, W. A., 446.
 Haseman, L., 72, 219.
 Hassid, W. Z., 456.
 Hastings, A. B., 725.
 Hastings, E. G., 820.
 Hatch, T. F., 444.
 Hatcher, B. W., 598.
 Hathaway, G. A., 445.
 Hathaway, H. E., 801.
 Hathaway, I. L., 84.
 Hattings, C. C., 506.
 Hauck, C. W., 394.
 Hauck, H. M., 419.
 Hauge, S. M., 90, 376, 518, 809, 856.
 Haugen, A. O., 360.
 Hauser, E. A., 140.
 Haut, I. C., 53.
 Havens, W. P., Jr., 816.
 Havis, A. L., 596.
 Hawker, L. E., 602.
 Hawkes, J. G., 746.
 Hawkins, L. E., 375, 867.
 Hawks, J. E., 410, 550.
 Hawthorn, L. R., 47.
 Hay, J. G., 289.
 Hay, J. E., 101.
 Hay, R. C., 688.
 Hay, W. M., 717.
 Haydak, M. H., 82, 83, 550.
 Hayden, C. C., 93.
 Hayes, J. F., 626.

- Hayes, M. C., 127.
 Hayhurst, H., 656.
 Haynes, S. K., 379.
 Hays, F. A., 468.
 Hays, M. B., 423.
 Hays, M. M., 805.
 Hays, O. E., 164.
 Hayston, J. T., 526.
 Hayward, H. E., 463, 634.
 Hazel, L. N., 610.
 Hazelwood, B. P., 185.
 Hazen, M. W., 84.
 Headington, R. C., 837.
 Headlee, T. J., 499.
 Headley, F. B., 538.
 Heady, E. O., 690.
 Hearn, W. E., 162.
 Heath, L. M., 247, 530.
 Hecht, A., 467.
 Heckman, J. H., 404.
 Hedges, T. R., 721.
 Hegarty, C. P., 292.
 Held, J. L., 297.
 Heiman, V., 377, 518, 824.
 Hein, M. A., 757.
 Heinicke, A. J., 287, 335.
 Heinze, P. H., 47.
 Heller, V. G., 515.
 Hellmayr, C. E., 652.
 Helm, C. A., 41.
 Helphenstine, R. K., Jr., 255.
 Hemingway, A., 583.
 Hemphill, P. V., 394, 693.
 Hendershott, B. A., 814.
 Henderson, C. F., 77, 83, 512.
 Henderson, E. W., 237, 669, 801.
 Henderson, H. B., 807.
 Henderson, H. O., 92, 478.
 Henderson, J. L., 674.
 Henderson, L. M., 153.
 Henderson, M. T., 761.
 Henderson, R. G., 484.
 Henderson, W., 804.
 Henderson, W. W., 221.
 Hendricks, R. H., 729.
 Hendricks, S. B., 7.
 Hendrickson, A. H., 737.
 Hendrickson, R. F., 841.
 Hendrix, W. E., 538, 836.
 Hendry, J. L., 390.
 Henning, J. C., 241.
 Henle, G., 323.
 Henle, W., 445.
 Henry, A. M., 586.
 Henry, G. F., 621.
 Henry, K. M., 234.
 Henry, R. L., 8, 428.
 Henschel, A. F., 706.
 Hensel, R. L., 42.
 Hensley, H. C., 404.
 Henson, P. R., 757.
 Hepner, L. W., 658.
 Hepting, G. H., 639, 780.
 Herber, E. C., 230.
 Heriot, A. D., 369.
 Herman, C. M., 251.
 Herman, H. A., 34, 90, 92, 99, 380.
 Hernández Medina, B., 619, 628.
 Herrick, C. A., 248.
 Herrick, E. H., 614.
 Herrick, J. A., 458.
 Herrmann, L. F., 269.
 Hertel, K. L., 149.
 Hervey, E. J., 111.
 Hervey, G. E. R., 368, 785.
 Hervey, G. W., 401.
 Herzer, F. H., 807.
 Hesse, A. J., 512.
 Hesse, C. O., 338.
 Hettig, R. A., 523.
 Heuberger, J. W., 427.
 Heublein, G. W., 136.
 Heuser, G. F., 377, 800, 801.
 Hewetson, F. N., 480.
 Heyne, E. G., 618, 655.
 Heywang, B. W., 518.
 Hibbs, J. W., 91.
 Hicock, H. W., 535, 768.
 Hide, J. C., 595.
 Higbe, R. V., 554.
 Higbee, E. C., 55.
 Higgins, A. E. H., 784.
 Higgins, L. A., 808.
 Hightower, L. E., 105.
 Higinbotham, N., 746.
 Hilborn, M. T., 58, 652.
 Hildebrand, E. M., 69, 215, 343, 777.
 Hildreth, A. C., 590.
 Hildreth, C. G., 120.
 Hill, C. C., 794.
 Hill, C. H., 384.
 Hill, E. B., 839.
 Hill, H. D., 747.
 Hill, H. W., 96.
 Hill, J. A., 144.
 Hill, R. C., 697.
 Hill, R. E., 73, 790.
 Hiller, A., 587.
 Hillig, F., 585, 586.
 Hills, C. H., 353.
 Hills, J. L., 574.
 Hills, K. L., 772.
 Hilston, N. W., 83.
 Hilton, J. H., 90, 614, 809.
 Hiner, R. L., 181.
 Hines, L., 199, 722.
 Hinkle, D. A., 758.
 Hinman, R. B., 513.
 Hinman, W. F., 559, 847.
 Hinshaw, W. R., 251, 686.
 Hitchcock, A. E., 174, 479.
 Hitchcock, J. A., 118.
 Hitt, H. L., 843.
 Hixon, R. M., 456.
 Hixson, E., 223, 362.
 Hlynka, I., 813.
 Hoadley, A. D., 487.
 Hoagland, D. R., 314.
 Hobbs, C. S., 513.
 Hobby, G. L., 388.
 Hock, C. W., 570, 864.
 Hockley, H. A., 399.
 Hodge, E. S., 6, 193, 456, 487.
 Hodges, J. A., 393, 693.
 Hodgkiss, W. S., 103, 452, 456, 585, 598, 645.
 Hodgson, R. E., 91.
 Hodson, A. C., 367.
 Hodson, A. Z., 390.
 Hoeben, J. G. H., 527.
 Hoecker, R. W., 399, 539, 618, 693, 838.
 Hoerner, G. R., 66.
 Hoerner, J. L., 226, 508.
 Hofer, A. W., 630, 763.
 Hoffecker, E., 626.
 Hoffman, C. C., 508.
 Hoffman, E., 88.
 Hoffman, G. P., 189.
 Hoffman, H. A., 826.
 Hoffman, I. C., 334.
 Hoffman, M. B., 336.
 Hofmann, K., 9, 711, 726.
 Hogan, A. G., 15, 135, 323, 379, 514, 549.
 Hoge, W. G., 166.
 Hogg, P. G., 185.
 Holbert, J. C., 610.
 Holdaway, F. G., 656.
 Holiday, E. R., 172.
 Hollaender, A., 444.
 Holland, E. B., 288.
 Holland, E. O., 144.
 Hollander, F., 184.
 Hollander, W. F., 749.
 Hollands, H. F., 262.
 Hollembek, H. D., 428.
 Hollenbeck, C. M., 5.
 Hollinger, M. E., 700.
 Holloway, J. K., 77, 83, 512.
 Hollowell, E. A., 20.
 Holm, G. E., 433, 731.
 Holm, J. E., 523.
 Holmes, A. D., 238, 288, 677.
 Holmes, F. O., 346, 490.
 Holmes, J. C., 400, 539.
 Holmes, J. (Outhouse), 288.
 Holmes, R. S., 162.
 Holsoe, T., 722.
 Holst, E. C., 82.
 Holst, S., 34.
 Holt, L. E., Jr., 712.
 Holton, C. S., 608, 772.
 Honess, R. F., 245, 531.
 Honey, E. E., 486.
 Hood, E. G., 239, 240, 813.
 Hooker, C. W., 472.
 Hooper, J. H., 377.
 Hoos, S., 393.
 Hoover, C. D., 186, 325, 453, 618.
 Hoover, S. R., 461.
 Hopkins, J. A., 690, 693, 694.
 Hopkins, J. W., 159, 805, 806.
 Hoppe, P. E., 343.
 Hoppert, C. A., 295, 850.
 Hoppert, E. H., 47.

- Horlacher, W. R., 142, 867.
 Horn, C., 206.
 Horn, C. L., 619, 629.
 Horn, M. J., 724.
 Horne, L. W., 848.
 Horner, C. K., 19.
 Horning, E. S., 26, 451, 740.
 Horrall, B. E., 7.
 Horsfall, J. G., 650, 778.
 Horsfall, W. R., 72, 227, 370, 498, 661, 721.
 Horton, R. E., 14.
 Horwood, R. E., 91.
 Hoskins, J. D., 2.
 Hosmer, R. S., 143.
 Hostetler, E. H., 514, 797.
 Hotchkiss, R. D., 583.
 Hotson, H. H., 70.
 Houchin, O. B., 34.
 Hough, W. S., 230.
 Houghland, G. V. C., 644.
 House, H. D., 25.
 Houseman, E. E., 621.
 Hove, E., 151, 456.
 How, J. E., 176.
 Howard, A., 352.
 Howard, F. L., 308.
 Howard, H. W., 317.
 Howard, L. B., 366, 789.
 Howard, N. F., 787.
 Howard, R. S., Jr., 662.
 Howe, H., 399, 693.
 Howe, P. E., 845.
 Howe, P. R., 412.
 Howell, D. E., 826.
 Howell, J. C., 654.
 Howells, H. P., 585.
 Howitt, B. F., 226.
 Howlett, F., 420.
 Howlett, F. S., 179, 334.
 Hoy, B., 500.
 Hoyman, W. G., 640.
 Hoyt, W. G., 15.
 Irdlicka, A., 570.
 Hubbard, C. E., 620.
 Hubbell, D. S., 596.
 Huberman, M. A., 201.
 Huberty, M. R., 45.
 Hucker, G. J., 157.
 Hockett, H. C., 79, 785.
 Huddleson, I. F., 524.
 Hudson, C. B., 750.
 Hudson, R. S., 235, 513.
 Hudson, W. B., 288.
 Huebner, C. F., 818.
 Huenemann, R. L., 561.
 Huestis, R. R., 469.
 Huffaker, C. B., 781.
 Huffman, C. F., 90, 93, 238, 295, 810.
 Huffman, W. T., 97.
 Hughes, C. W., 7.
 Hughes, E. H., 516.
 Hughes, J. S., 666, 671.
 Huizinga, H., 819.
 Hulbary, R. L., 465.
 Hulea, A., 772.
 Hultz, F. S., 181.
 Humbert, R. P., 301.
 Hume, A. N., 186.
 Hume, H. H., 144.
 Humfeld, H., 458.
 Humm, H. J., 174.
 Hummel, F. C., 846.
 Hummel, M. E., 713.
 Humphrey, G. D., 144.
 Humphrey, H. B., 207.
 Humphrey, L. M., 40.
 Humphreys, S., 684, 799.
 Hunt, G. M., 254, 787.
 Hunt, W. T., 361.
 Hunter, A. C., 586.
 Hunter, F. M., 144.
 Hunter, G., 240.
 Hunter, J. H., 54, 185.
 Hunter, R. F., 413.
 Hurd, E. R., 262.
 Hurst, E., 526.
 Hurst, V., 321, 471, 754.
 Hutchings, B. L., 175, 458.
 Hutchins, L. M., 357.
 Hutchison, C. B., 4, 144, 145.
 Hutner, S. H., 677.
 Hutson, J. B., 841.
 Hutson, R., 230.
 Hutt, F. B., 377, 469, 749.
 Hutton, C. E., 150.
 Hutzel, J. M., 499, 786.
 Hynes, H. B. N., 661.
 Hyslop, J. A., 97.
 Idnani, J. A., 249.
 Illingsworth, J. F., 217.
 Ilyin, G., 174.
 Ines, M., 97, 98.
 Imle, E. P., 491, 495, 656.
 Ingle, R. T., 100.
 Ingols, R. S., 6.
 Ingram, J. W., 362, 508.
 Inman, O. L., 25.
 Insko, W. M., Jr., 377, 805.
 Irvin, C. J., 619.
 Irwin, J. O., 293, 381.
 Irwin, M. R., 37, 678.
 Isbell, H., 418, 711.
 Isely, D., 72, 362, 659, 783.
 Isker, R. A., 410.
 Israel, P., 793.
 Ivanoff, S. S., 59.
 Ivanowski, D., 211.
 Iverson, V. E., 64.
 Ives, P. T., 749.
 Ivy, A. C., 39, 569.
 Izumi, E. M., 385.
 Jaap, R. G., 377, 802.
 Jacchia, L., 445.
 Jack, E. L., 239, 812.
 Jackson, L. E., 372.
 Jackson, M. L., 6.
 Jackson, R. F., 586.
 Jacob, H. E., 481.
 Jacob, K. D., 167.
 Jacobson, H. G. M., 806.
 Jacobson, N. L., 680.
 Jacoby, F. C., 862.
 Jaffe, H., 770.
 James, L. E., 84.
 James, L. H., 573.
 James, M. T., 783.
 Jamison, V. C., 161.
 Janes, B. E., 764.
 Janes, M. J., 73, 783.
 Janes, R. L., 221, 365, 657.
 Jankiewicz, J., 251.
 Jardine, J. T., 146.
 Jarvis, N. D., 849.
 Jary, S. G., 367.
 Jayne, E. P., 103.
 Jeans, P. C., 283, 410.
 Jebens, A. B., 840.
 Jefferson, C. H., 691, 692.
 Jeffery, G., 248.
 Jeffrey, F. P., 750.
 Jellison, W. L., 365.
 Jenkins, A. E., 25, 357, 430, 779.
 Jenkins, E. W., 52.
 Jenkins, J. G., 188.
 Jenkins, J. M., Jr., 627, 765.
 Jenkins, L., 72, 219.
 Jenkins, R. R., 150.
 Jenkins, W. A., 343.
 Jennings, M. A., 600.
 Jennison, M. W., 444.
 Jensen, C., 809.
 Jensen, E., 116.
 Jensen, H. L., 176.
 Jensen, J. H., 59, 352.
 Jensen, L. B., 846.
 Jeppesen, Q. E., 682.
 Jepson, L. R., 362.
 Jessen, R. J., 111.
 Jewett, H. H., 78.
 Jewitt, T. N., 597.
 Jodon, N. E., 623.
 Joffe, J. S., 18.
 Johannson, H., 415.
 John, R. P., 602.
 Johns, C. K., 811.
 Johnsgard, G. A., 185.
 Johnson, A. C., 506.
 Johnson, A. E. W., 533.
 Johnson, A. G., 772.
 Johnson, A. N., 491.
 Johnson, A. R., 537.
 Johnson, B. C., 231.
 Johnson, C. G., 654, 665.
 Johnson, C. M., 603.
 Johnson, D. L., 428.
 Johnson, E., 414, 514.
 Johnson, E. A., 620.
 Johnson, E. C., 144, 147.
 Johnson, E. H., 862.
 Johnson, E. L., 518.
 Johnson, E. M., 211, 457.
 Johnson, F., 207.
 Johnson, G. M., 586.
 Johnson, H. A., 125.
 Johnson, H. W., 62.
 Johnson, J., 211.

- Johnson, J. A., Jr., 618.
 Johnson, J. P., 499.
 Johnson, L. P. V., 651.
 Johnson, L. V., 283.
 Johnson, M. B., 330, 403.
 Johnson, M. J., 309, 555.
 Johnson, P. E., 808.
 Johnson, P. R., 42.
 Johnson, R. B., 36.
 Johnson, R. L., 286.
 Johnson, S. R., 83, 797.
 Johnson, T., 348.
 Johnson, T. V., 840.
 Johnston, C., 858.
 Johnston, C. B., 814.
 Johnston, C. N., 302.
 Johnston, C. O., 207.
 Johnston, F. A., 411.
 Johnston, H. R., 227.
 Johnston, J. R., 494.
 Johnston, P. E., 401.
 Johnston, S., 196.
 Johnstone-Wallace, D. B., 506.
 Joley, L. E., 481.
 Jolliffe, N., 565, 705.
 Jones, C. H., 311.
 Jones, C. M., 563.
 Jones, D. B., 724, 725.
 Jones, D. F., 467.
 Jones, D. G., 287.
 Jones, D. L., 42, 47, 105.
 Jones, D. W. Kent, 436.
 Jones, E. W., 77.
 Jones, F. D., 256.
 Jones, H. A., 332, 657, 658.
 Jones, I. D., 155, 295.
 Jones, I. R., 90.
 Jones, J. H., 42, 84, 86, 550, 587.
 Jones, J. M., 35, 84, 86, 513.
 Jones, J. W., 623.
 Jones, K. L., 19.
 Jones, L., 429.
 Jones, L. R., 243.
 Jones, M. A., 442, 570, 629.
 Jones, M. G., 503.
 Jones, M. M., 41, 105.
 Jones, R. E., 749.
 Jones, R. J., 166.
 Jones, S. E., 73, 218.
 Jones, T. C., 823.
 Jones, T. D., 444.
 Jones, T. H., 143, 369, 479, 784.
 Jones, W. Neilson, 496.
 Jordan, J. C., 144.
 Jordan, P. S., 516, 799.
 Jordan, R., 848.
 Jorgensen, H., 355.
 Jorlin, D. F., 454.
 Josephson, D. V., 91, 671.
 Josephson, E. S., 290, 592.
 Joslyn, M. A., 432.
 Joss, E. C., 97.
 Joy, E. L., 216.
 Joyce, C. B., 230, 498.
 Judkins, W. P., 456.
 Jugenheimer, R. W., 618, 655.
 Jukes, T. H., 89, 669.
 Julianelle, L. A., 678.
 Jung, R. W., 569.
 Jungherr, E., 685.
 Justice, O. L., 333.
 Kabler, C. V., 712.
 Kalser, W. G., 689.
 Kakavas, J. C., 101, 244.
 Kallnkevich, A., 604.
 Kaliss, N., 35, 749.
 Kamen, M. D., 456.
 Kammlade, W. G., 234.
 Kanas, L. R., 625.
 Kaplan, J. J., 393.
 Kaplan, M. M., 678.
 Kapp, L. C., 40.
 Kapur, H. R., 244.
 Karling, J. S., 463.
 Karper, R. E., 42, 608.
 Karpov, A. S., 318.
 Karpovich, P. V., 709.
 Karr, E. H., 501.
 Kariash, R. J., 379.
 Kartar Singh Thind, 204.
 Kassanis, B., 210.
 Kassner, E. W., 284.
 Kast, C. C., 459.
 Kates, K. C., 384, 821.
 Katznelson, H., 600.
 Kaufert, F. H., 651.
 Kavanagh, F., 602, 770.
 Kavanagh, V. W., 770.
 Kearney, T. H., 25.
 Kearns, H. G. II., 654.
 Keast, J. C., 528.
 Kenting, F. E., 84.
 Keating, J. F., 572.
 Keck, C. B., 794.
 Keen, F. P., 659.
 Keener, H. A., 95.
 Keeney, P. E., 573.
 Keifer, H. H., 781.
 Keil, H. L., 429.
 Keiles, E. O., 134.
 Keim, F. D., 41, 84.
 Keith, T. B., 666.
 Keitt, G. W., 444.
 Kell, W. V., 186.
 Keller, K. R., 760.
 Keller, W. F., 579.
 Kelley, J. B., 833.
 Kelley, T. F., 226.
 Kelley, V. W., 49.
 Kellogg, C. E., 446, 497, 594.
 Kellogg, H. B., Jr., 472.
 Kellogg, W. L., 377.
 Kelly, E., 553, 671.
 Kelly, E. G., 499.
 Kelly, J. T., 706.
 Kelly, P. L., 91, 807.
 Kelsner, R. A., 814.
 Kemmerer, A. R., 127, 438, 551, 731, 733, 798.
 Kemp, M., 520.
 Kempster, H. L., 84, 110, 322.
 Kenaga, E. E., 656, 783.
 Kendall, N., 414.
 Kendrick, J. B., 350, 355.
 KenKnight, G., 59, 640.
 Kennard, D. C., 235, 378, 516.
 Kennedy, C. W., 610.
 Kennedy, V. D., 839.
 Kent, G. C., 58, 761.
 Kent, N. L., 279.
 Kent-Jones, D. W., 436.
 Kenway, C. B., 169.
 Kepner, R. A., 593.
 Kerkis, J. J., 175.
 Kernkamp, H. C. II., 103, 246, 684, 821.
 Kerr, R. H., 586.
 Kerrigan, S., 40.
 Kersten, H., 170, 743.
 Kertesz, Z. I., 129, 735.
 Kesselman, J., 584.
 Kettering, J. H., 290.
 Ketteringham, I. E., 370.
 Kevorkian, A. G., 579, 619, 628, 649, 722.
 Key, K. H. L., 217.
 Keys, A., 706.
 Keyworth, W. G., 775.
 Khlebnikova, N. A., 170.
 Khot, S. S., 611.
 Khuen, E. C., 818.
 Kibler, H. H., 34, 90, 183, 320.
 Kibrick, E. A., 183.
 Kienholz, J. R., 492.
 Klesselbach, T. A., 41.
 Kik, M. C., 83.
 Kilgore, L. B., 500.
 Killough, D. T., 42, 105.
 Kilner, S. B., 432.
 Kilpatrick, E. P., 840.
 Kimbrough, W. D., 341, 352.
 Kincaid, C., 84.
 Kincaid, C. M., 514, 797.
 King, A. J., 270.
 King, B. M., 41.
 King, C. G., 565.
 King, C. J., 62.
 King, E. J., 731.
 King, E. W., 782.
 King, G. H., 575.
 King, L. S., 386.
 King, R. T., 217.
 King, T. R., 377, 803.
 King, W. H., 586.
 King, W. V., 81.
 King Wilson, W., 235.
 Kingsbury, R. M., 189.
 Klipfinger, D. C., 341.
 Kirby, R. S., 491.
 Kirch, E. R., 592.
 Kirchberger, H., 393.
 Kirchner, J. G., 365.
 Kirk, D. E., 834.
 Kirk, W. G., 87, 232, 622, 797.
 Kirkpatrick, A., 550.
 Kirkpatrick, H. F. W., 204.
 Kirsten, G., 586.
 Kiser, J. S., 849.

- Kiser, O. M., 516.
 Kistler, S. S., 149.
 Kitzelman, C. H., 676.
 Kittredge, J., 445.
 Klein, J. W., 116.
 Klemme, A. W., 454.
 Klemme, D. E., 424, 716.
 Klempner, F. W., 725.
 Klempner, E., 184.
 Kleneberger, E., 527.
 Kligman, A. M., 203, 355.
 Kline, B. E., 584.
 Kline, L. V., 637.
 Kline, O. L., 559.
 Kling, W., 394, 399.
 Klingman, G., 575.
 Klippert, W. E., 25.
 Klipple, G. E., 698.
 Klüber, H., 130.
 Knandel, H. C., 376, 377, 517.
 Knapp, B., Jr., 181, 513, 514, 610.
 Knaysl, G., 7, 92, 175.
 Knechtges, J. W., 240.
 Kneen, E., 5, 41, 59.
 Knight, A. T., 596.
 Knight, C. A., 353.
 Knight, H., 74.
 Knipe, F. W., 657, 662.
 Knipling, E. F., 817, 820.
 Knobel, E. W., 302.
 Khodt, C. B., 91, 672.
 Knorr, P., 202.
 Knott, E. M., 133.
 Knott, J. C., 575.
 Knott, J. E., 478.
 Knowles, D., 272, 861.
 Knowles, E., 718.
 Knowlton, G. F., 217, 226, 362, 366, 653, 781, 783.
 Knox, C. W., 88.
 Knudson, L., 767.
 Knudson, R. L., 97, 246.
 Koch, L. W., 491.
 Kocholaty, W., 460.
 Koehler, B., 484.
 Koehn, C. J., 807.
 Koenig, V. L., 590.
 Koepfer, J. M., 487.
 Koepsell, H. J., 309.
 Koerner, T. A., 282.
 Koger, L. M., 826.
 Koger, M., 91, 321, 575.
 Kohler, G. M., 428.
 Kohnmeyer, J. B., 428.
 Kohls, G. M., 512, 664.
 Kohman, E. F., 29, 713.
 Kohnke, H., 303.
 Kolb, J. J., 729, 730.
 Kolimorgen, W. M., 271.
 Kolmer, J. A., 883.
 Kolthoff, I. M., 5, 290.
 Komarik, S. L., 440.
 Komp, W. H. W., 661.
 Kon, S. K., 234.
 Konis, E., 174.
 Konst, H., 817.
 Kopland, D. V., 618.
 Korschgen, L. J., 361.
 Kortright, F. H., 653.
 Kortschak, H. P., 593.
 Koser, S. A., 524.
 Kostoff, D., 466.
 Kraay, G. M., 149.
 Kraemer, E. O., 149.
 Kraenzel, C. F., 393.
 Kraissl, C. J., 444.
 Kramer, A., 340.
 Kramer, B., 586.
 Kramer, P. J., 743.
 Kramer, P. R., 202.
 Kramke, E. H., 377.
 Krantz, F. A., 64.
 Kratzer, F. H., 237, 801.
 Kraus, G., 586.
 Kraus, J. E., 47.
 Krause, A. C., 130.
 Krause, M. E., 558.
 Krauss, W., 863.
 Krauss, W. E., 90, 91, 380, 520, 811.
 Kraybill, H. R., 374, 575, 739, 798.
 Kreitlow, K. W., 58.
 Kreutzer, W. A., 72, 776.
 Krewatch, A. V., 687.
 Kreysa, F. J., 586.
 Krider, J. L., 513.
 Krienke, W. A., 808.
 Krishnaswami, N., 317.
 Kriss, B., 184.
 Krombein, K. V., 371, 664.
 Kruetzkamp, J., 411.
 Krug, C. A., 749.
 Krukovsky, V. N., 7.
 Krusekopf, H. H., 15.
 Kubea, V., 390, 529.
 Kucinski, K. J., 165.
 Kuhlman, A. H., 90, 519, 807.
 Kuhrt, W. J., 536.
 Kumar, L. S. S., 179, 204.
 Kummer, F. A., 258.
 Kummerow, F. A., 859, 860.
 Kunerth, B. L., 275, 701.
 Kupperman, H. S., 39.
 Kuschke, B., 864.
 Kuschke, B. M., 701.
 Kushner, H. F., 323.
 Kuska, J. B., 618.
 Kuykendall, R., 41, 454, 598.
 Kuzmeski, J. W., 377.
 Kyle, E. J., 3, 144.
 Laake, E. W., 98.
 Laanes, T., 183.
 La Bossier, I., 864.
 Lacey, M. S., 215.
 Lackey, C. F., 349.
 La Cour, L. F., 607.
 Ladejinsky, W. I., 123, 840.
 Laessle, A. M., 461.
 La Follette, J. R., 72.
 LaGasse, F. S., 29.
 Lagrone, W. F., 113.
 Lamanna, C., 26, 457.
 Lamar, W. L., 688.
 LaMaster, J. P., 811.
 Lamb, J., Jr., 596.
 Lamerson, P. G., 655, 782.
 La Moglia, J., 274.
 Lamoreux, W. F., 237, 377, 468, 749.
 Lampen, J. O., 740.
 Lana, E. P., 64.
 Landauer, W., 323, 460.
 Landerkin, G. B., 460.
 Landis, P. H., 541, 542.
 Landis, Q., 585.
 Landquist, V. L., 560.
 Landsberg, H., 14, 443.
 Landy, M., 863.
 Lane, R., 673.
 Lane, R. L., 414.
 Lanford, C. S., 703.
 Lange, W. H., Jr., 506.
 Langham, R. F., 100.
 Langham, W., 514.
 Langley, B. C., 59.
 Lungsford, E. L., 45, 113.
 Lanham, B. T., Jr., 113.
 Lanham, F. B., 109.
 Lanham, W. B., Jr., 374.
 Lantz, H. L., 50, 179.
 Lardy, H. A., 610.
 Larose, P., 422.
 Larson, A. O., 366.
 Larson, F., 620.
 Larson, R. A., 520.
 La Rue, C. D., 29.
 Larzelere, H. E., 264.
 Lasater, T. E., 566.
 Lash, E., 97.
 Lasley, J. F., 34.
 Lassalle, L. J., 141.
 Lathrop, F. H., 782.
 Latta, R., 509.
 Lau, H. S. C., 721.
 Laudani, H., 365.
 Laude, H. H., 329, 618.
 Laufer, L., 555, 850.
 Laufer, S., 555, 856.
 Laufer, M. A., 353.
 Lauman, G. N., 143.
 Laurens, H., 444.
 Laurie, A., 341.
 Lavallée, E., 344.
 Lavin, G. I., 816.
 Lavoipierre, M., 658.
 Lawrence, G. H. M., 833.
 Laws, J. O., 445.
 Laws, W. D., 590.
 Leach, J. G., 497.
 Leach, L. D., 487.
 Leach, R., 215.
 Leahy, H. P., 690.
 Leary, W. V., 565.
 Lease, E. J., 565.
 Lease, J. G., 565.

- Leatham, J. H., 472.
 Leavell, G., 729.
 LeBarron, R. B., 639.
 LeBeau, F. J., 484, 722.
 Lebrun, E. J., 262.
 Lechyccka, M., 417.
 LeClerg, E. L., 189, 761.
 Ledingham, R. J., 349.
 Lee, A., 628, 720.
 Lee, A. R., 379.
 Lee, C. D., 531, 686.
 Lee, F. A., 150, 151.
 Lee, J. G., 84, 135.
 Lee, J. G., Jr., 144.
 Lefebvre, C. L., 62, 203, 350
 622.
 Legwen, W. A., 632.
 Lehman, R. S., 504.
 Lehman, S. G., 484.
 Lehmann, E. W., 252.
 Lehninger, A. L., 583.
 Leichsenring, J. M., 275, 549.
 Leighly, J., 12.
 Leighton, A., 240, 383.
 Lenane, D. J., 776.
 Lenert, L. G., 662.
 Lennox, C. G., 624.
 Lennox, F. G., 29.
 Leonard, E. R., 32.
 Leonard, O. A., 185, 476, 544,
 618.
 Leonard, S. L., 616.
 Leong, P. C., 135.
 Leonian, L. H., 28.
 Leopold, L. B., 736.
 LePage, G. A., 135, 740.
 Lepard, O. L., 90, 181, 610.
 Le Palley, R. H., 658.
 Lepkovsky, S., 558, 705, 727.
 Lerner, I. M., 377, 472, 613,
 749, 750.
 LeRosen, A. L., 430.
 Lesley, J. W., 609.
 Lesley, M. M., 609.
 Lesser, S. O., 543.
 Leukel, R. W., 58, 345, 490.
 Levam, A., 35.
 Levcowich, T., 562.
 Leverton, R. M., 128, 277, 852,
 853.
 Levine, A. S., 11, 238, 296,
 440, 459.
 Levine, J., 382.
 Levine, M., 243, 296, 457.
 Levine, P. P., 248, 686, 814.
 Levitt, J., 64.
 Levy, L., 418.
 Lew, W., 816.
 Lewis, A. A., 34, 91, 94, 470,
 673.
 Lewis, A. B., 393.
 Lewis, D., 813.
 Lewis, H. C., 72, 75.
 Lewis, I. M., 739.
 Lewis, J. M., 282, 707.
 Lewis, L., 710.
 Lewls, R. D., 54, 185.
 L'Hote, H. J., 142.
 Li, C. H., 39, 616.
 Liamina, A. N., 801.
 Lichte, M. E., 286.
 Liebow, A. A., 677.
 Light, A. E., 417.
 Light, P., 14.
 Lightower, L. E., 41.
 Lilleland, O., 631.
 Lilley, H., 226.
 Lillie, F. R., 322.
 Lilly, J. H., 782.
 Lilly, V. G., 28.
 Limber, D. P., 649.
 Lincoln, R. E., 318, 599.
 Lind, C. J., 305, 430.
 Lind, H. Y., 277.
 Linder, D. H., 70.
 Lindgren, D. L., 659, 789.
 Lindner, M., 726.
 Lindquist, A. W., 81, 226, 498
 795.
 Lindsay, M. A., 484.
 Lindsay, W. R., 25.
 Lindstrom, D. E., 542.
 Lineberry, R. A., 340, 713,
 861.
 Lingard, H. T., 265.
 Lininger, F. F., 143.
 Link, K. P., 725, 817, 818,
 854.
 Linn, M. B., 61, 343, 640.
 Linsley, E. G., 72, 73, 362,
 498, 499, 659.
 Linsley, R. K., 445.
 Linton, G. M., 651.
 Lionberger, H. F., 405, 406.
 Lipmann, F., 430, 583.
 List, G. M., 72, 222, 658, 782.
 Lister, J. H., 122.
 Littell, M. L., 330.
 Little, H. W., 121.
 Little, L., 380.
 Little, P. A., 815.
 Little, T. M., 180.
 Little, V. A., 73.
 Litton, J. B., 532.
 Lively, C. E., 124, 405, 406.
 Livers, J. J., 693.
 Livesay, E. A., 473.
 Livingston, J. E., 41, 58, 59,
 490.
 Livingstone, E. M., 506, 791.
 Lloyd, F. E., 601.
 Lochhead, A. G., 228, 460.
 Locke, L. F., 762.
 Locke, S. B., 59, 427, 769.
 Lockhart, C. H., 614.
 Lockhart, E. E., 14.
 Lockwood, S., 782.
 Loeffel, W. J., 84.
 Loesecke, H. W. von, 297, 845.
 Loest, F. C., 215.
 Loewen, P. R., 453.
 Logan, C. H., 131.
 Logan, P. P., 547.
 Logan, S., 782.
 Lohman, M. L., 359.
 Lohmar, R., 725.
 Long, C. N. II., 410, 725.
 Long, E. M., 634.
 Long, H. F., 380.
 Long, J. D., 151, 835.
 Long, L. E., 722.
 Long, M. E., 124, 540.
 Long, T. E., 14, 259, 392.
 Longwell, J. H., 373.
 Look, W. C., 656.
 Loomis, C. P., 843.
 Loomis, N. H., 197.
 Loos, C. A., 779.
 Loosli, J. K., 90, 390, 519.
 Lord, D. J., 277.
 Lord, H. H., 399.
 Lorenz, F. W., 322.
 Lorenz, O. A., 207, 478, 761.
 Lorenz, R. C., 722.
 Lott, R. V., 338.
 Lotwin, G., 561.
 Lotz, J. C., 99, 384.
 Lounsbury, C., 16, 722.
 Love, E. L., 814.
 Love, H. T., 579.
 Love, S. K., 158, 736.
 Love, W. G., 683.
 Lovell, E., 425.
 Lowe, R., 807.
 Lowenhaupt, B., 774.
 Lubitz, J. A., 377.
 Lucas, H. E., 49.
 Lucas, H. L., 519.
 Lucas, P. S., 95, 675.
 Lucas, R. E., 737.
 Luck, J. M., 409, 463.
 Luckner, J. T., 97.
 Ludbrook, W. V., 496.
 Ludwin, I., 521.
 Luebke, R. H., 120, 267, 330,
 403.
 Luebke, B. J., 841.
 Luke, W. J., 211.
 Lumb, J. W., 389.
 Lund, A. P., 567.
 Lund, H. O., 662.
 Lundegårdh, H., 447.
 Lundell, C. L., 169.
 Lundquist, N. S., 80, 809.
 Lundquist, R. E., 14.
 Lundy, G., 269.
 Luria, S. E., 430, 769.
 Lurie, M. B., 445.
 Ash, J. L., 318, 610, 810.
 Ash, R. H., 514, 797.
 Atman, A. S., 330.
 Atman, B. F., 31, 485.
 Attrell, E. S., 808.
 Atz, J. M., 325, 334.
 Ayle, C., 499, 786.
 Lyle, E. W., 59.
 Ayle, S. P., 831.
 Lyman, C. M., 84.

- Lynch, S. J., 197.
 Lyness, W. E., 41.
 Lynn, C. J., 426.
 Lyon, B. M., 815.
 Lyon, C. B., 213, 560.
 Lyon, R., 754.
 Lythgoe, H. C., 673.
 Ma, R., 70, 741, 742.
 MacCorquodale, D. W., 705.
 MacDaniels, L. H., 339.
 MacDonald, A. J., 378.
 Macdougall, R. S., 497.
 MacDowell, E. C., 183.
 MacFadyen, D. A., 587, 588.
 MacFarlane, D. L., 393, 693, 838.
 MacGillivray, J. H., 478, 540, 855.
 MacGregor, A. E., 360.
 Machacek, J. E., 771.
 Machella, T. E., 553, 554.
 Macht, D. I., 606.
 MacIntire, W. H., 185, 456, 598.
 MacIntyre, C. F., 742.
 Mack, M. J., 96, 814.
 Mack, P. B., 131, 864.
 MacKellar, W. M., 97, 98.
 Mackenzie, C. G., 716.
 Mackerras, I. M., 217.
 Mackerras, M. J., 217.
 Mackinnay, G., 9, 437.
 Mackintosh, D. L., 272, 666.
 MacLachlan, E. A., 589.
 MacLaury, D. W., 428, 473.
 MacLean, J. D., 254.
 MacLeish, K., 271.
 MacLennan, K., 709.
 MacLeod, A., 403.
 MacLeod, C. M., 526.
 MacLeod, F. L., 85.
 MacLeod, G. F., 362, 786.
 MacMillan, H. G., 748.
 MacMillan, M. J., 735.
 Macy, H., 96, 522, 808.
 Macy, I. G., 846, 851.
 Madden, A. H., 498, 504.
 Maddock, D. R., 783.
 Maddox, D., 143.
 Madhava Rao, A., 709.
 Madsen, D. E., 519.
 Madsen, L. L., 97, 98, 375.
 Magee, C. J., 491.
 Magness, J. R., 616, 627.
 Mahaffey, L. W., 528.
 Maheux, G., 782.
 Mahoney, C. H., 629.
 Mail, G. A., 372.
 Mallery, O. T., 523.
 Mallis, A., 362, 501.
 Mullan, W. L., 387.
 Mallon, M. G., 277.
 Malmsten, H. E., 526.
 Malott, E. O., 402.
 Maney, T. J., 49.
 Mangelsdorf, P. C., 25, 177, 741.
 Mangus, A. R., 698, 844.
 Manis, H. C., 75, 227, 509.
 Manke, K. F., 42.
 Manley, R. H., 724.
 Mann, L. K., 32.
 Manus, L. J., 722.
 Manweiler, J., 360.
 Manwell, R. D., 248.
 Marble, D. R., 376, 676.
 Marco, P. R., 773.
 Marcovitch, S., 784, 785.
 Marcum, W. B., 448.
 Margolf, P., 667.
 Margolin, A. S., 722.
 Margolin, S., 610.
 Margolis, L. H., 556.
 Marinelli, L. D., 746.
 Marlon, P. T., 84.
 Mark, I., 697.
 Marlowe, R. H., 657, 794.
 Marquardt, J. C., 92, 239, 521.
 Marquette, W., 571.
 Marr, J. C., 299.
 Marriott, W. M., 410.
 Marsh, A. G., 852, 853.
 Marsh, G. L., 155, 296, 297.
 Marsh, H., 676.
 Marshall, C. E., 15, 301, 750.
 Marshall, D. A., 721.
 Marshall, F. H. A., 38.
 Marshall, G. E., 213, 503, 782.
 Marshall, J., 223, 500, 660, 783.
 Marshall, J. B., 312.
 Marshall, R., 288.
 Marshall, R. E., 633.
 Marten, E. A., 165.
 Marth, P. C., 341, 637.
 Martin, C. H., 509.
 Martin, F. E., 102.
 Martin, G. W., 293.
 Martin, H. H., 299.
 Martin, J. P., 24, 352, 502, 646.
 Martin, J. W., 721.
 Martin, T. L., 451.
 Martin, W. E., 635.
 Martin, W. H., 64, 144, 812.
 Martin, W. J., 641.
 Martin, W. P., 451.
 Martin, W. R., Jr., 339.
 Martindale, J. G., 422.
 Martinez Crovetto, R., 740.
 Martinez Moreno, J. I., 643.
 Martini, M. L., 621.
 Murvel, J. A., 376.
 Mason, 59.
 Mason, A. C., 782.
 Mason, H. L., 138, 710.
 Mason, I. C., 195, 196.
 Mason, K. E., 472, 564.
 Mason, T. G., 605, 744.
 Massey, A. B., 309.
 Massey, C. L., 219.
 Massey, Z. A., 807.
 Mather, J. W., 721.
 Mathes, R., 508.
 Matthews, F. P., 99, 103.
 Matthews, O. R., 762.
 Matson, H., 184.
 Matthew, I. S., 200.
 Matthews, E., 387.
 Matthews, E. D., 426.
 Matthews, F. M., 620.
 Matthews, G. D., 14.
 Mattice, M. R., 406.
 Mattick, A. T. R., 381.
 Matzke, E. B., 465.
 Mauersberger, H. R., 285, 572.
 Maurer, F. D., 823.
 Maw, A. J. G., 612.
 Maw, W. A., 613.
 Maxwell, D. C., 737.
 May, C. O., 839.
 May, J., 752.
 Mayer, A., 211.
 Mayer, D. T., 34.
 Mayer, G. G., 592.
 Maynard, L. A., 90, 231, 519, 544.
 Mayor, E., 647.
 Mayton, E. L., 185, 626.
 Mazia, D., 602.
 McBain, J. W., 149.
 McBryde, C. N., 98.
 McBryde, F. W., 159.
 McBurnie, H. V., 77, 83.
 McCall, G. L., 782.
 McCall, K. B., 457.
 McCall, M. A., 616.
 McCalla, T. M., 309.
 McCallan, S. E. A., 641, 770.
 McCance, R. A., 279.
 McCann, L. H., 722.
 McCann, L. P., 465.
 McCarthy, G. P., 84.
 McCarty, M. A., 666.
 McCarty, R. G., 99.
 McCay, C. M., 90, 95.
 McChesney, E. W., 673.
 McClellan, W. D., 358, 495.
 McClelland, C. K., 40, 41, 755, 768.
 McClelland, J. A. C., 433.
 McClendon, J. F., 430.
 McClendon, J. W., 185.
 McClintock, B., 178.
 McClintock, J. A., 460.
 McCluggage, M. E., 625.
 McClure, F. J., 568, 569.
 McClure, H. E., 217, 361.
 McClure, T. T., 65.
 McColloch, L. P., 491.
 McCollum, E. V., 134, 408.
 McComas, E. W., 85.
 McComas, P. S., 45, 113.
 McComb, H. A., 47.
 McConnell, E. S., 429.
 McConnell, H. S., 782.

- McCool, M. M., 308.
 McCoord, A. B., 855.
 McCormick, A. M., 715.
 McCown, J. M., 186, 189.
 McCown, M., 194.
 McCoy, E., 310.
 McCoy, J. H., 399.
 McCready, R. M., 456.
 McCrory, S. A., 48.
 McCulloch, E. C., 103, 250, 685, 826.
 McCullough, N. B., 677.
 McDaniel, A., 330.
 McDaniel, E. I., 656, 784.
 McDermott, L. A., 294.
 McDole, G. R., 596.
 McDonald, E. J., 586.
 McDonald, I. W., 389, 528, 529.
 McDougle, H. C., 99.
 McDowell, C. H., 42, 144.
 McDowell, J. C., 869.
 McEachern, D., 818.
 McElroy, L. W., 284, 411.
 McElroy, W. R., 730.
 McFadden, E. S., 42.
 McFarlane, W. D., 591.
 McGarr, R. L., 366.
 McGee, R. V., 272.
 McGeorge, W. T., 20.
 McGinnis, J., 377.
 McGovran, E. R., 222, 498, 782.
 McGrath, C. B., 103.
 McGregor, E. A., 77, 230.
 McGregor, W. S., 72, 73.
 McGuire, G., 707.
 McGuire, J. R., 201.
 McHargue, J. S., 193, 452, 456, 487, 585, 590, 598, 645.
 McHenry, E. W., 555.
 McHenry, J. T., 88.
 McIlvaite, T. C., 756.
 McIlvanie, S. K., 606.
 McIntire, G. B., 266.
 McIntire, J. M., 153.
 McIntosh, J. A., 513, 561, 847.
 McIntyre, C. W., 34, 92, 110.
 McIntyre, H. L., 496.
 McKay, H., 275, 543, 852, 853.
 McKay, R., 214.
 McKee, C., 147.
 McKee, R., 43, 186.
 McKellar, A. D., 343.
 McKenzie, F., 233.
 McKenzie, F. F., 34, 322.
 McKenzie, H. L., 224.
 McKenzie, M. A., 71.
 McKenzie, R. B., 542.
 McKibben, E. G., 690, 827.
 McKibbin, J. M., 87, 668, 854.
 McKinney, H. H., 353.
 McKinney, R. S., 236.
 McLaren, A. D., 585.
 McLaughlin, J. H., 58.
 McLaughlin, W. T., 450.
 McLaughlin, W. W., 14.
 McLean, F. C., 705.
 McLeod, W. M., 671.
 McLester, J. S., 565.
 McLintock, T. F., 200.
 McMains, P. M., 837.
 McManus, T. B., 90, 797.
 McMaster, M., 457.
 McMillan, R. T., 261.
 McMillen, W. N., 514.
 McMunn, R. L., 49, 479.
 McMurray, J. F., 722.
 McMurtry, J. E., Jr., 45.
 McNair, A. D., 43.
 McNally, E. H., 805.
 McNamara, H. C., 143, 185.
 McNamara, R. L., 698.
 McNaught, J. B., 220.
 McNeal, W. B., 144.
 McNeal, X., 721.
 McNeel, T. E., 81.
 McNeil, E., 251, 686.
 McNew, G. L., 48, 212, 640, 770, 776.
 McNutt, S. H., 101, 822.
 McPhce, H. C., 35, 97, 610.
 McPherson, W. K., 114.
 McRoberts, V. F., 84, 514.
 McSpadden, B. J., 377.
 McVeigh, I., 313.
 McVoy, E., 697.
 McWhirter, L., 544.
 McWhorter, O. T., 492.
 Mead, H. W., 486, 771.
 Mead, S. W., 611, 808, 811.
 Mead, T. H., 234.
 Means, R. H., 253, 537, 798.
 Mecchi, E., 237, 669, 801.
 Mech, S. J., 829.
 Medler, J. T., 504.
 Medovy, H., 242.
 Meenen, H. J., 693.
 Mehlquist, G. A. L., 358.
 Mehrhof, N. R., 236, 798.
 Meler, F. P., 428.
 Meier, O. W., 690.
 Meikeljohn, G., 525.
 Meiller, E. J., 701.
 Meinke, W. W., 127.
 Meinzner, O. E., 106.
 Meites, J., 34, 90, 91, 470, 753, 754.
 Melhus, I. E., 343, 761.
 Mellanby, K., 654, 665.
 Melsted, S. W., 149.
 Melville, D. B., 9, 711, 726.
 Melville, R., 714.
 Melzer, F., 590.
 Mendall, S. C., 785.
 Menze, R. E., 393.
 Mercer, J. C., 868.
 Merdian, B., 405.
 Meriweather, B., 250.
 Merkle, F. G., 160, 595, 628.
 Merriam, C. F., 445.
 Merrick, F., 397.
 Merrill, H. A., 499.
 Merrill, R. M., 185.
 Merrill, S., Jr., 199.
 Merrill, T. A., 186.
 Merry, J., 29.
 Mertz, E. T., 319, 529, 684.
 Mervine, E. M., 761.
 Merwe, J. S. v. d., 511.
 Merz, A., 408, 409.
 Metcalf, C. L., 361.
 Metcalf, R. L., 658.
 Metzger, C. H., 623.
 Metzger, W. H., 537, 595.
 Meyer, A. F., 736.
 Meyer, C. E., 566.
 Meyer, H., 234.
 Meyer, K., 388.
 Meyer, K. A., 706.
 Meyer, K. F., 98, 409, 678, 686.
 Meyer, K. H., 149, 577.
 Meyer, R. K., 39, 321.
 Meyer, W. H., 200.
 Meyers, A. M., Jr., 112.
 Michaelree, J. F., 417.
 Michelbacher, A. E., 80.
 Mick, A. H., 16.
 Mickel, C. E., 664.
 Middleton, J. T., 59.
 Middleley, A. R., 22, 447, 485.
 Mighell, R. L., 693.
 Millam, D. F., 714.
 Milbrath, D. G., 343.
 Milbrath, J. A., 767.
 Miles, H. W., 210, 367.
 Miles, I. E., 185.
 Miles, L. E., 348.
 Miles, M., 210.
 Millitzer, W. E., 457.
 Milk, R. G., 844.
 Millar, C. E., 168, 737.
 Millar, J. A. S., 677.
 Miller, A. W., 97, 98.
 Miller, B. F., 445.
 Miller, C. D., 277.
 Miller, D., 517.
 Miller, E. C., 603, 618.
 Miller, E. J., 585.
 Miller, E. V., 197.
 Miller, G. L., 582.
 Miller, J. C., 35, 84, 186, 341, 627.
 Miller, J. I., 513, 515.
 Miller, J. K., 779.
 Miller, J. O., 210.
 Miller, L. I., 484.
 Miller, L. P., 172.
 Miller, M. F., 142.
 Miller, M. H., 684, 799.
 Miller, P. A., 359, 779, 780.
 Miller, P. G., 94, 808.
 Miller, R. C., 535, 666, 797.
 Miller, W. T., 97.
 Milligan, D. A., 533.
 Milligan, O., 848.

- Milligan, W. O., 149.
 Millis, J. S., 144.
 Millman, N., 709.
 Mills, C. A., 430.
 Mills, D. R., 442.
 Mills, H. B., 652, 655.
 Mills, R. C., 667, 669.
 Mills, W. R., 619.
 Milzer, A., 384.
 Minarik, C. E., 25, 59.
 Minasian, E. V., 377.
 Minert, K. R., 382.
 Minges, P. A., 470, 546, 764, 855.
 Mingle, C. K., 814.
 Minor, F. W., 461.
 Mirick, G. S., 526.
 Miroshnichenko, K. G., 31.
 Mirov, N. T., 638.
 Misner, E. G., 398.
 Mitchell, B. L., 226.
 Mitchell, C. A., 524.
 Mitchell, H. H., 128, 231, 277, 514.
 Mitchell, H. K., 430.
 Mitchell, J. H., 31.
 Mitchell, J. W., 33, 46.
 Mitchell, R. B., 61.
 Mix, A. E., 585.
 Mixner, J. P., 34, 91, 321, 471, 614.
 Mizell, L. R., 571.
 Moe, L. H., 826.
 Moetsch, J. C., 678.
 Mohan, B. N., 391.
 Mohler, J. R., 97, 814.
 Mohler, W. M., 97.
 Mohr, J. L., 607.
 Mohr, H. C., 407.
 Molitor, H., 565.
 Molln, A. E., 318, 513.
 Monroe, C. F., 90, 91, 520.
 Monroe, D., 141.
 Monson, O. W., 333, 638.
 Monteith, J., Jr., 206.
 Montermoso, J. C., 170.
 Montes, J. G., 445.
 Monteverde, J. J., 246.
 Montgomery, G., 693, 696.
 Montgomery, H. B. S., 777.
 Mook, P. V., 650.
 Moomaw, I. W., 394.
 Moore, C. R., 89.
 Moore, E., 678.
 Moore, E. L., 441.
 Moore, H. R., 429.
 Moore, J. S., 92.
 Moore, L. A., 90, 243, 436, 463, 680.
 Moore, M., 676.
 Moore, P. B. K., 864.
 Moore, R. E., 3.
 Moore, B. H., 463, 629.
 Moore, S., 581, 725.
 Moore, T., 524.
 Moore, W., 364.
 Moore, W. C., 203.
 Moreland, C. F., 607.
 Moreland, R. W., 501.
 Morgan, A. F., 144, 147, 564, 851.
 Morgan, B. B., 884, 527, 654, 682.
 Morgan, C. F., 39.
 Morgan, D., 677.
 Morgan, I. M., 386.
 Morgan, M. F., 306.
 Morgan, R., 202.
 Morgan, T. H., 323.
 Morgan, W. L., 491.
 Morgareidge, K., 590.
 Morin, K. V., 449.
 Morison, F. L., 839.
 Morley, M. J., 420.
 Morrell, C. A., 706.
 Morrell, E., 85.
 Morrill, A. W., Jr., 361, 503, 782.
 Morrill, J. L., 144.
 Morris, B. T., 449.
 Morris, C. T., 580.
 Morris, D. L., 580.
 Morris, H. D., 619.
 Morris, H. E., 640.
 Morris, H. F., 42, 47, 59, 3-8.
 Morris, R. F., 502, 664.
 Morrison, B. Y., 332, 627, 768.
 Morrison, F. B., 513, 515, 798.
 Morrison, H. B., 96, 807.
 Morrow, E. B., 481.
 Mortensen, E., 42, 47, 63.
 Morton, M., 330.
 Morton, M. E., 726.
 Mosbacher, E. G., 542.
 Moser, A. M., 548.
 Moser, F., 185, 455.
 Moses, C. S., 784.
 Moskey, H. E., 97.
 Mossman, H. W., 324.
 Mote, D. C., 500.
 Motheral, J., 111.
 Mott, L. O., 97, 246, 683.
 Mottorn, H. H., 296, 441.
 Mottet, A. L., 780.
 Mottis, G. N., 269.
 Moulton, F. R., 444.
 Moulton, J. E., 61.
 Moxon, A. L., 308, 454, 527.
 Moyer, A. W., 702.
 Moyer, J. C., 438.
 Moyle, W. J., 410.
 Moynihan, I. W., 102, 386.
 Mrak, E. M., 11, 154, 157, 158, 310, 358, 440, 493.
 Mudd, S., 445, 459.
 Muelder, K. D., 553.
 Mueller, C. D., 469.
 Mueller, I. M., 744.
 Mueller, W. S., 675.
 Muesbeck, C. F. W., 499.
 Muhr, G. R., 307.
 Muhrer, M. E., 323.
 Muir, G. W., 232, 245.
 Muir, R. D., 243.
 Muir, R. M., 748.
 Mujica R. F., 351.
 Mukerjee, B. N., 171.
 Mulchinnock, W. J., 244.
 Mulford, D. J., 279.
 Mulhearn, C. R., 217.
 Mull, L. E., 807.
 Muller, C. H., 201.
 Mullins, T., 113.
 Mullison, E., 605.
 Mullison, W. R., 605.
 Mumford, C. D., 839.
 Mumford, D. C., 114.
 Mumford, E., 575.
 Muncie, J. H., 295.
 Mundinger, F. G., 785.
 Munger, F., 72, 74.
 Munger, H. M., 429.
 Munger, T. T., 639.
 Munn, M. T., 762.
 Munro, J. A., 360, 659, 781.
 Munro, S. S., 248, 518.
 Munsell, H. E., 557.
 Munsell, R. I., 758.
 Munsey, V. E., 585.
 Muntzing, A., 35.
 Murdoch, E. T., 735.
 Murneck, A. E., 47, 335.
 Murphy, H. C., 484.
 Murphy, J. M., 91.
 Murphy, L. M., 336.
 Murphy, R. P., 429, 748.
 Murphy, R. R., 667.
 Murray, W. G., 264.
 Muse, M., 141.
 Mushatt, C., 799.
 Mushett, C. W., 139.
 Musckett, A. E., 350.
 Mussehl, F. E., 84, 105, 379.
 Musselman, H. H., 575.
 Musser, H. B., 143, 619.
 Muth, O. H., 528.
 Myburgh, S. J., 232.
 Myers, C. E., 332, 628.
 Myers, C. H., 69.
 Myers, H. E., 595, 693.
 Myers, H. G., 429, 457.
 Myers, J. A., 814.
 Myers, R. J., 149.
 Myers, S., 428.
 Myers, W. I., 2, 144.
 Myers, W. M., 747.
 Myler, J. L., 466.
 Nabours, R. K., 655.
 Nattel, J. A., 598.
 Nagel, C. M., 761.
 Nagy, R., 26.
 Naile, F., 795.
 Najjar, V. A., 684, 712.
 Nalbandov, A., 183, 377.
 Nansen, H. N., 493.
 Nardy, R. V., 782.
 Nash, R. W., 372.
 Nasset, E. S., 135.
 Nath, P., 179.
 Natividade, J. V., 316.

- Neal, E. M., 47, 84, 86.
 Neal, J. H., 828.
 Neal, O. M., Jr., 722.
 Neal, W. M., 527.
 Neatby, K. W., 169, 642.
 Nebel, B. R., 609, 746.
 Needler, L. L., 831.
 Neel, J. K., 88.
 Neel, L. B., 238, 807.
 Neely, J. W., 185, 618.
 Neetzel, J. R., 639.
 Neill, J. C., 175.
 Nellson-Jones, W., 496.
 Nel, R. I., 506, 660.
 Nelson, A. Z., 393.
 Nelson, C., Jr., 59.
 Nelson, E. M., 564.
 Nelson, F. E., 457, 812.
 Nelson, H. D., 76, 782, 788.
 Nelson, H. G., 520.
 Nelson, J. A., 671.
 Nelson, J. B., 391.
 Nelson, J. W., 721, 857.
 Nelson, L., 697.
 Nelson, N. M., 104.
 Nelson, N. T., 326.
 Nelson, P., 693.
 Nelson, P. M., 545.
 Nelson, R., 637.
 Nelson, R. C., 190, 607.
 Nelson, R. H., 612, 749.
 Nelson, W. R., 17.
 Nesbitt, H. H. S., 665.
 Nestler, R. B., 361.
 Nettles, W. C., 216.
 Neuhauser, M. D., 674.
 Neustadt, M. H., 290.
 Nevens, W. B., 90.
 Newcomer, E. J., 80, 784.
 Newell, L. C., 41.
 Newhall, A. G., 333, 647.
 Newhall, S. M., 140.
 Newman, F. S., 651.
 Newsom, L. D., 362.
 Newton, R., 312.
 Nicholas, J. E., 257, 287, 619, 671, 811.
 Nicholls, J. R., 436.
 Nichols, R. A., 576.
 Nichols, R. E., 428, 676.
 Nicholson, H. H., 532.
 Nicholson, J. T. L., 554.
 Nicholson, L. G., 250.
 Nicholson, M., 360.
 Nickell, L. G., 496.
 Nickels, C. B., 783.
 Nickerson, D., 140.
 Nickerson, W. J., 601.
 Nickerson, W. J., Jr., 740.
 Nicolet, B. H., 90, 91, 580, 582.
 Niederhof, C. H., 14, 343, 445, 639.
 Nielsen, C. S., 465.
 Nielsen, E., 727.
 Nielsen, E. L., 83.
 Nielsen, H. M., 519.
 Nielsen, L. W., 345.
 Nier, A. O., 583.
 Nikitin, A. A., 346, 484.
 Nikolniczuk, N., 613.
 Nilsson, H. W., 374.
 Noble, L. W., 361.
 Nobrega, N. R., 490.
 Noers, R. D., 129.
 Nolan, L. C., 124, 696.
 Noland, L. E., 682.
 Nold, T., 296.
 Noll, C. F., 595, 619.
 Nolla, J. A. B., 625.
 Nolte, A. J., 297.
 Norby, C. H., 845.
 Nord, F. F., 430.
 Norman, A. G., 166, 622.
 Norris, L. C., 377, 800, 801.
 Norris, L. M., 549.
 Norris, R. E., 19.
 Norris, R. T., 498.
 Norris, T. H., 456.
 Northen, H. T., 27.
 Norwood, G., 15.
 Nowotarski, J. S., 804.
 Nuckols, S. B., 624.
 Nugent, T. J., 488.
 Nunheimer, T. D., 177.
 Nusbaum, C. J., 58, 484.
 Nutini, L. G., 444.
 Nutter, P., 701.
 Nutting, M. D. F., 753.
 Novak, R. F., 693.
 Novikov, V. A., 30.
 Nye, C., 144.
 Nystrom, A. B., 238.
 Obenshain, S. S., 185, 327.
 Obregón Botero, R., 491.
 O'Brien, A. T., 131.
 O'Brien, M. P., 392.
 O'Brien, R. E., 185, 327.
 Ochoa, S., 705.
 Odland, M. L., 763.
 Odland, T. E., 167.
 Oestlund, O. W., 658.
 Offutt, M. L., 586.
 Ogdon, M., 123, 130, 405.
 Ogler, T. L., 599.
 Ohlson, M. A., 852, 853.
 O'Kelly, J. F., 41, 325, 618.
 Olbrycht, T. M., 319.
 Oldham, H., 709.
 Oldroyd, L. T., 719.
 Olds, H. F., 500.
 Olitsky, P. K., 387.
 Olivier, L., 250.
 Olmo, H. P., 196, 467, 479, 482.
 O'ney, A. J., 52, 627.
 Olney, F. J., 99.
 Olsen, M. W., 519, 532.
 Olsen, O. W., 683.
 Olsen, S. R., 453.
 Olson, A. R., 535.
 Olson, C., Jr., 288, 361.
 Olson, F. C., 92, 721.
 Olson, F. R., 166, 306, 757.
 Olson H. C., 808.
 Olson, H. F., 14.
 Olson, J. C., 808.
 Olson, L. C., 185, 760.
 Olson, O. E., 308, 315, 454, 587.
 Olson, T. M., 90.
 Oliver, A., 85.
 O'Malley, C. M., 674, 734.
 O'Mara, J. G., 34, 41.
 O'Neil, J. B., 37, 88, 320, 669.
 O'Neill, W. J., 792.
 Oostling, H. J., 311, 638.
 O'Rear, H. M., 97.
 Orent-Kelles, E., 134.
 Organ, J. G., 862.
 Orr, A. E., 575.
 Orr, J., 546.
 Orton, C. R., 144, 484.
 Osborne, J., 295.
 Osborne, S. L., 715.
 Oser, B. L., 564.
 Oserkowsky, J., 742.
 Osgood, E. E., 278.
 O'Shea, H. E., 554.
 Osteen, O. L., 97, 98, 246, 683.
 Osterhout, W. J. V., 606.
 Ostrolenk, M., 586, 663.
 Otis, C. K., 535.
 O'Toole, E., 309.
 Ort, W. H., 517.
 Otto, M. L., 537, 693.
 Outhouse, J. (Holmes), 288.
 Overbeek, J. van, 464.
 Overholser, E. L., 194, 195, 632.
 Overley, F. L., 194, 195, 632.
 Overman, A., 582.
 Overman, R. S., 854.
 Owen, F. V., 34.
 Owen, W. B., 793.
 Owen, W. L., Jr., 73.
 Owens, A. L., 694.
 Owens, C. E., 640.
 Owens, H. S., 769.
 Owens, W. W., 619.
 Oxer, D. T., 512.
 Oyler, M. D., 428.
 Packer, A., 822.
 Packer, R. A., 102.
 Paden, W. R., 454.
 Pady, S. M., 649.
 Painter, E. P., 579.
 Painter, J. H., 649.
 Painter, R. H., 102, 655, 783.
 Pal, B. P., 179.
 Palmer, C. C., 101, 681.
 Palmer, L. S., 82, 550, 721, 857.
 Palmiter, D. H., 206, 215.
 Palser, B. F., 742.
 Pangborn, H., 226.
 Parfitt, E. H., 520.
 Parham, S. A., 188.

- Parish, H. E., 794.
 Park, E. R., 316.
 Park, M., 485.
 Parker, B. W., 444.
 Parker, E. R., 198, 636.
 Parker, G., 276.
 Parker, G. L., 106.
 Parker, H. K., 585.
 Parker, J. E., 34, 322, 377.
 Parker, M. E., 520.
 Parker, M. M., 332, 627.
 Parker, M. W., 607.
 Parker, R. L., 655, 782, 783.
 Parker, R. R., 664.
 Parker-Rhodes, A. F., 205.
 Parkes, A. S., 616.
 Parkhurst, R. T., 377.
 Parkin, E. A., 654.
 Parkin, G., 497.
 Parks, H. B., 25, 73.
 Parks, T. H., 370.
 Parks, W. R., 400.
 Farman, D. C., 97.
 Parrott, P. J., 287.
 Parshall, R. L., 299.
 Parson, H. E., 778.
 Parsons, F. L., 623, 696.
 Parsons, O. A., 868.
 Partridge, N. L., 14, 766, 776.
 Passin, H., 697.
 Patch, L. H., 507, 792.
 Patek, A. J., Jr., 552.
 Patrick, H., 376, 377, 667.
 Patrick, T. M., 6.
 Patterson, T. M., 186.
 Patton, A. R., 667.
 Patton, H. S., 693.
 Patton, J. A., 98.
 Patton, M. B., 275, 852, 853.
 Patton, R. L., 658.
 Patty, R. L., 253.
 Paul, J. B., 271.
 Paul, L. C., 221.
 Paulsen, C. G., 828.
 Paulson, W. E., 84, 110.
 Payne, L. F., 666.
 Pearce, G. W., 368, 785.
 Pearce, J., 359.
 Pearlman, W. H., 727.
 Pearson, C. S., 302, 407.
 Pearson, E. O., 226.
 Pearson, P. B., 84.
 Peck, R. H., 47.
 Peczenik, O., 753.
 Pedersen, M. W., 506.
 Pederson, C. S., 10, 120, 274, 295.
 Peech, M., 19.
 Peele, T. C., 185.
 Peevy, W. J., 15.
 Pegrum, D. F., 536.
 Peirson, H. B., 372.
 Peluffo, C. A., 388.
 Pemberton, C. E., 218, 646.
 Pence, R. O., 579.
 Pendleton, R. L., 163, 722.
 Penman, H. L., 30.
 Penn, G. H., Jr., 360.
 Pennell, M. Y., 141.
 Pennington, L., 731.
 Pennock, W., 628.
 Penquite, R., 377, 802.
 Pepkowitz, L. P., 429.
 Pepper, B. B., 784.
 Poppler, H. J., 96, 176.
 Porcival, G. P., 187, 188.
 Perkins, A. T., 595.
 Perkins, J. F., 510.
 Perkinson, J. D., Jr., 419.
 Perlmann, G. E., 430.
 Perlmutter, F., 52.
 Perlzweig, W. A., 556.
 Persing, C. O., 499.
 Person, H. L., 201.
 Person, L. H., 481.
 Personius, C. J., 699.
 Peter, A., 240.
 Peters, E. J., 63.
 Peters, J. P., 410.
 Peters, R. F., 226.
 Peters, W. H., 230, 799.
 Petersen, W. E., 91, 380, 682.
 Peterson, A., 499.
 Peterson, A. G., 400.
 Peterson, A. W., 575.
 Peterson, D. F., 621.
 Peterson, H. O., 250.
 Peterson, M. J., 835.
 Peterson, M. L., 185.
 Peterson, V. E., 92.
 Peterson, W. H., 175, 458, 555, 740, 744.
 Peterson, W. J., 26, 216, 666.
 Peto, H. B., 169.
 Pett, L. B., 135.
 Petterssen, S., 126.
 Pfeiffer, C. A., 472.
 Pfund, M. C., 272.
 Phaff, H. J., 310, 358, 493.
 Phelps, E. B., 444.
 Phillips, A. M., 361.
 Phillips, C. A., 92.
 Phillips, C. D., 539, 540.
 Phillips, M. M., 185.
 Phillips, P. H., 35, 90, 278, 514, 610, 809.
 Phillips, R. W., 97, 181, 513, 514, 516, 610, 800.
 Phillips, V., 410.
 Phillis, E., 605, 744.
 Picken, L. E. R., 577.
 Picken, M. B., 425.
 Pickett, B. S., 47, 50, 179, 338.
 Pickett, W. F., 618, 628, 633.
 Pickford, G. D., 43, 326, 327.
 Pickles, A., 222.
 Pleniazek, S. A., 337.
 Pierce, C. W., 696.
 Pierce, E. C., 462, 775.
 Piercey, W. S., 680.
 Piercy, P. L., 99.
 Pierre, W. H., 144, 757.
 Pierson, A. H., 57.
 Piestrak, V., 469.
 Pifer, R. W., 429.
 Pigulevskaya, N. N., 175.
 Pike, R. A., 108.
 Pilgrim, F. J., 859.
 Pinches, H. E., 687.
 Pinckard, J. A., 63, 484, 618, 640.
 Pinckney, J. S., 794.
 Pincus, G., 727.
 Pine, W. H., 397, 537, 603.
 Piper, A. M., 828.
 Piper, C. S., 60.
 Pipkin, A. C., 370.
 Piquett, P. G., 782.
 Pirie, N. W., 545.
 Pirone, P. P., 62, 213, 358, 496, 646, 651.
 Pitner, J., 186, 325.
 Pittman, D. D., 303.
 Pittman, M. S., 272, 275, 701, 852, 853.
 Pixley, R. A., 576.
 Plagge, H. H., 51.
 Plant, H. K., 655.
 Plastring, W. N., 819.
 Platz, B. R., 860.
 Plumb, G. H., 499.
 Plummer, B. E., 782.
 Plummer, C. C., 795.
 Plummer, P. J. G., 247, 530, 684.
 Pohlman, J. M., 41.
 Poesch, G. H., 649.
 Pohle, E. M., 233, 513.
 Pohlman, G. G., 165, 756.
 Polderboer, E. B., 653.
 Polevitzky, K., 459.
 Poll, A., 840.
 Polk, H. D., 801.
 Pollack, M. A., 726.
 Pollard, A. J., 117.
 Pollard, H. N., 361.
 Pollard, L. H., 191.
 Pollard, M., 104, 825.
 Pollinger, W. E., 618, 628.
 Polskin, L. J., 803.
 Poole C. F., 627.
 Poole, R. F., 485.
 Poos, F. W., 658.
 Pope, J. B., 15.
 Popenoe, W., 310.
 Popper, H., 413, 706, 708.
 Porges, N. 726.
 Porritt, B. D., 422.
 Porter, A. M., 763.
 Porter, C. R., 618.
 Porter, D. A., 98, 100, 384, 680.
 Porter D. R., 29, 713.
 Porter, J. N., 27.
 Porter, J. W., 428.
 Porter, L. C., 219.
 Posell, J. J., 105.
 Post, A. H., 596, 618.
 Potter, V. R., 589.
 Potter, W. D., 158, 736.
 Pounnden, W. D., 91.

- Powell, D., 356, 357.
 Powell, E. L., 84, 135.
 Powell, R. C., Jr., 672.
 Powell, R. E., 149.
 Powers, W. L., 758.
 Powning, R. F., 797.
 Pratt, A. D., 520.
 Pratt, M. R., 141.
 Prescott, S. C., 578.
 Presley, J. T., 62.
 Presper, M. L., 715.
 Preston, R. D., 317.
 Prevot, P., 173.
 Price, C., 45.
 Price, E. W., 98.
 Price, F. E., 834.
 Price, W. A., 330, 331.
 Price, W. V., 813.
 Prideaux, G. F., 219.
 Prince, A. L., 168, 738.
 Prince, F. S., 187, 188.
 Pritchett, C. S., 845.
 Probst, A. H., 476.
 Proctor, B. E., 440, 444.
 Proebsting, E. L., 632.
 Prouty, C. C., 513, 847.
 Prucha, M. J., 239.
 Pryor, D. E., 354, 355, 646.
 Pubols, B. H., 262.
 Pucher, G. W., 315.
 Puck, T. T., 445.
 Puffer, M. E., 559.
 Pugsley, A. T., 210.
 Pugsley, L. I., 706.
 Pulley, G. N., 297.
 Puncochar, J. F., 849.
 Puri, I. M., 662.
 Putman, W. L., 661.
 Putnam, D. N., 808.
 Pyenson, L., 505.
 Pyke, M., 130, 714.
 Pyke, W. E., 849.

 Quackenbush, F. W., 575, 855, 859, 860.
 Quayle, H. J., 788.
 Quayle, W. L., 373.
 Quesenberry, J. R., 610, 666.
 Questel, D. D., 226.
 Quinby, J. R., 42, 608.
 Quinlan, J., 323, 324.
 Quinlan, L. R., 628.
 Quintero, A. G., 445.
 Quisenberry, J. H., 35.
 Quisenberry, K. S., 41.
 Quong, T. L., 242.

 Rabstein, M. M., 814.
 Radford, C. D., 372.
 Ragan, M. S., 133.
 Raghavachari, K., 245.
 Raghavan, T. S., 318.
 Ragland, C. H., 722.
 Ragonese, A. E., 312.
 Ragsdale, A. C., 34, 90, 92, 110, 320, 380.

 Rahn, E. M., 476, 628.
 Rahn, O., 457.
 Rainey, W. L., 151.
 Rainwater, C. F., 366, 368, 783.
 Raiziss, G. W., 678.
 Raleigh, G. J., 629.
 Ralli, E. P., 551.
 Ralston, N. P., 34, 92.
 Ram Mohan Rao, S., 658.
 Ramachandran, K., 709.
 Ramakrishnan, T. S., 347.
 Ramsey, A. S., 618.
 Ramsey, G. B., 343.
 Ramstad, P. E., 431.
 Randall, G. O., 342.
 Randall, M., 456.
 Randle, S. B., 373.
 Randolph, L. F., 747.
 Randolph, U. A., 47.
 Rangaswami Ayyangar, G. N., 317.
 Rao, A. M., 709.
 Rapaport, S., 858.
 Rapp, K. E., 590.
 Rapuzzi, A. E., 284.
 Rasmussen, E. J., 68, 215, 766.
 Rasmussen, R. A., 516, 667.
 Rasquin, P., 614.
 Ratajak, E. J., 769.
 Ratcliffe, F. N., 217.
 Ratcliffe, S. C., 696.
 Ratelke, W., 378, 379.
 Rather, H. C., 187, 755.
 Ratsek, J. C., 47, 55.
 Rau, G. J., 223.
 Rau, Y. V. S., 709.
 Rauchenstein, E., 116.
 Rauchschnwalbe, O. E., 762.
 Raup, H. M., 461.
 Rawlins, T. E., 346.
 Ray, H. N., 245.
 Ray, W. W., 484, 485, 640, 642.
 Rea, H. E., 42.
 Read, P. R., 142.
 Ready, D., 45.
 Reaves, P. M., 808.
 Recknagel, A. B., 483, 638.
 Record, P. R., 377.
 Rector, R. R., 377.
 Reder, R., 702.
 Reece, R. P., 91, 181, 519, 610, 751, 753.
 Reed, H. M., 47.
 Reed, I. F., 256.
 Reed, J. F., 5, 638.
 Reed, O. E., 670.
 Reed, R. H., 784.
 Reedman, E. J., 805.
 Reeber, M. M., 76.
 Rees, G., 821.
 Reese, H. L., 254.
 Reeves, E., 378, 379.
 Reeves, E. L., 357.

 Reeves, R. G., 42, 741.
 Reeves, W. C., 226, 385, 386, 816.
 Regan, M. J., 34.
 Regan, M. M., 537, 693.
 Regan, W. M., 611.
 Reid, D. A., 42.
 Reid, E. H., 43, 326, 327.
 Reid, F. R., 167.
 Reid, J. J., 99, 254.
 Reid, J. W., 115.
 Reid, M. E., 29, 313.
 Reid, W. H. E., 5, 91, 92, 382.
 Reid, W. M., 249.
 Reinecke, R. M., 589.
 Reineke, E. P., 91, 92.
 Reinhard, H. J., 73, 227, 367.
 Reinhardt, W. O., 755.
 Reinhart, J. F., 663.
 Reinhold, J. G., 554.
 Reinking, O. A., 66.
 Reimiller, C. F., 610.
 Reiser, R., 234.
 Reitz, J. W., 119.
 Reitz, L. P., 618, 655.
 Renfro, M., 143.
 Renn, C. E., 662.
 Renne, R. R., 536.
 Renner, F. G., 620.
 Rentschler, H. C., 26, 444.
 Renther, W., 29, 335.
 Reynard, G. B., 67, 355.
 Reyniers, J. A., 444.
 Reynolds, E. B., 42, 185.
 Reynolds, H., 10, 46, 53.
 Reynolds, M. E., 465.
 Reynolds, R. V., 57.
 Rhian, M., 236, 237, 807, 826.
 Rhoad, A. O., 515, 610, 797.
 Rhoades, H. F., 15.
 Rhoads, C. P., 415.
 Rhodes, A. F. P., 205.
 Ricardo, C. L., 512.
 Rice, M. A., 31.
 Rice, R. R., 46.
 Rice, V. A., 468.
 Rich, C. E., 415.
 Richards, D. E., 528.
 Richards, G. V., 139, 712.
 Richardson, C. H., 365, 792.
 Richardson, E. C., 184.
 Richardson, G. A., 92.
 Richardson, G. L., 457.
 Richardson, H. H., 505, 782.
 Richardson, J. E., 545.
 Richardson, L. R., 84, 135, 379.
 Riches, J. H., 217.
 Richetta, A., 699.
 Richey, C. B., 256, 691, 831.
 Richey, F. D., 177.
 Richmond, T. R., 42.
 Richter, C. P., 412.
 Richter, J. H., 124.
 Rickett, H. W., 170.
 Riddle, O., 40, 183, 752.

- Biecker, C. R., 635.
 Biemer Schmid, G., 323.
 Rietz, J. H., 377.
 Rigden, J. T., 668.
 Riggs, C. W., 575.
 Riggs, L. K., 807.
 Rigler, N. E., 59.
 Riherd, P. T., 72, 73.
 Riker, A. J., 769.
 Riley, G. M., 751, 753.
 Rinear, E. H., 842.
 Ringel, S. J., 724, 725.
 Ringrose, R. C., 565.
 Ripley, P. O., 14.
 Ritcher, P. O., 78.
 Ritzman, E. G., 231.
 Rivnay, E., 662.
 Roach, J. R., 292.
 Roadhouse, C. L., 240.
 Robb, R. P., 778.
 Robbins, B. H., 531.
 Robbins, E. T., 513.
 Robbins, R. C., 561.
 Robbins, W. J., 25, 29, 70,
 312, 741, 742, 770.
 Robbins, W. R., 65.
 Robert, J. C., 143.
 Roberts, F. H. S., 529.
 Roberts, J., 425, 513, 847.
 Roberts, J. B., 841.
 Roberts, J. E., 42.
 Roberts, J. L., 166, 306, 757.
 Roberts, J. W., 206.
 Roberts, K. L., 300.
 Roberts, L. B., 551.
 Roberts, L. J., 411, 708, 709,
 862.
 Roberts, L. M., 747.
 Roberts, R., 73.
 Roberts, R. E., 376, 518.
 Roberts, R. H., 50, 340.
 Roberts, V. M., 862.
 Roberts, W., 807.
 Robertson, C. W., 777.
 Robertson, D., 389.
 Robertson, E. C., 444.
 Robertson, E. I., 237.
 Robertson, J. H., 317.
 Robertson, L., 838.
 Robertson, O. H., 445.
 Robertson, T., 749.
 Robins, A. L., 415.
 Robinson, C. H., 232.
 Robinson, E. C., 226.
 Robinson, F. B., 309.
 Robinson, F. W., 444.
 Robinson, G. G., 654, 664.
 Robinson, G. H., 428.
 Robinson, H. J., 815.
 Robinson, R., 172.
 Robinson, R. B., 757, 759.
 Robinson, W. B., 231.
 Robison, W. L., 87, 103.
 Robscheit-Robbins, F. S., 704.
 Rockwood, L. P., 76.
 Roderick, D. B., 81.
 Roderick, L. M., 389, 666, 676.
 Rodgers, A. D., III, 400.
 Rodriguez Lz, L., 351.
 Roe, A. F., 26.
 Roe, J. H., 9.
 Roepke, M. H., 103, 240, 684,
 821.
 Roessler E. B., 81.
 Rogan, J. J., 735.
 Rogers, B., 674.
 Rogers, C., 257.
 Rogers C. H., 42, 59, 208, 484.
 Rogers, D. H., 202.
 Rogers, H. T., 25, 598, 315.
 Rogers, L. A., 671.
 Rogers, L. H., 19.
 Rogers, L. K., 411.
 Rogers, R. E., 423.
 Rohner, L. V., 456.
 Rohrbaugh, L. M., 464.
 Rohwer, C., 829.
 Roland, A. E., 741.
 Roland, C. T., 520.
 Roles, F. M., 356.
 Romanoff, A. L., 377.
 Romshe, F. A., 193, 478, 765.
 Roney, J. N., 73.
 Roney, W. H., 276.
 Rosborough, J. F., 47.
 Rose, C. S., 283, 417, 711.
 Rose, J. J., 373.
 Rosen, H. R., 41, 343, 768.
 Rosenberg H. R., 281.
 Rosenfeld, A. H., 429.
 Rosenstein, I., 444.
 Roskelley, R. W., 844, 698.
 Ross, A. F., 353.
 Ross, J. G., 486.
 Ross, O. B., 514.
 Rosser, F. T., 805.
 Roth, E. R., 639.
 Rothenmich, E. R., 782.
 Rothen, A., 39.
 Rothgeb, B. E., 626.
 Roudabush, B. L., 217.
 Routh, J. I., 545.
 Rowan, W. S., 120.
 Rowe, J. A., 226.
 Rowe, P. B., 304.
 Rozeboom, L. E., 661.
 Ruben, S., 456.
 Rubin, M., 803.
 Rubins, E. J., 507.
 Rudd, R. W., 393, 540, 693.
 Rudolfs, W., 738.
 Ruether, C. A., 9.
 Rufener, W. W., 575.
 Ruggles, A. G., 500.
 Ruggles, E. K., 673.
 Ruiz Castaneda, M., 384.
 Runnels, T. D., 377, 722.
 Rupel, I. W., 809.
 Rupert, J. A., 497.
 Rusca, R. A., 43.
 Rusch, H. P., 584.
 Rusoff, L. L., 236, 673, 798,
 807.
 Russel, J. C., 15, 24.
 Russell, E. S., 750.
 Russell, J., 546.
 Russell, O. M., 671, 812.
 Russell, P. F., 391, 657.
 Russell, R. A., 135.
 Russell, W. C., 143, 800, 803.
 Russell, W. L., 749, 750.
 Rusznyak, S., 420.
 Ruth, W. A., 337.
 Rutherford, R. L., 823.
 Ruttle, M. L., 609.
 Ryan, A. E., 563.
 Ryan, B., 697, 698.
 Ryberg, R. E., 408, 409.
 Ryden, J. O., 855.
 Ryff, J. F., 248, 387.
 Ryker, T. C., 608, 642.
 Rykiewicz, H. J., 422.
 Ryser, G. K., 34.
 Sabrosky, C. W., 662.
 Sackville, J. P., 389.
 Sager, A. L., 144.
 Saidel, L. J., 90, 582.
 St. John, J. L., 195.
 Sakami, W., 729.
 Sakr, E. S., 211, 630.
 Salisbury, G. W., 90, 184.
 Salman, K. A., 659.
 Salomon, K., 284.
 Salter, L. A., Jr., 693.
 Salter, W. T., 706.
 Sammis, J. L., 813.
 Sampson, A. W., 170, 526.
 Sampson, W. L., 139.
 Samsel, L. G., 256.
 Samson, R. W., 58, 479, 491.
 Samuels, J. K., 394.
 Samuels, L. T., 590.
 Sanborn, B. G., 476.
 Sanborn, J. R., 12, 157, 443.
 Sanborn, R., 468.
 Sand, H. H., 828.
 Sandell, E. B., 730.
 Sanders, C. H., 95.
 Sanders, D. A., 100, 526, 819.
 Sanders, R. N., 615.
 Sanderson, D., 408, 540.
 Sando, C. E., 5.
 Sandstedt, R. M., 5.
 Sandstrom, W. M., 430.
 Sanford, G. B., 351.
 Sanford, L., 300.
 Sapozhnikov, D. I., 150.
 Sarett, H. P., 556.
 Sarles, M. P., 98, 528.
 Sarles, W. B., 238, 811.
 Satterfield, G. H., 238.
 Satterthwait, A. F., 369.
 Satterthwaite, F. E., 288.
 Saunders, H. C., 144.
 Saunders, W. D., 807.
 Savage, E. F., 53, 627, 634.
 Savage, E. S., 95, 811.
 Saville R. J., 396.
 Săvulescu, T., 772.
 Sawin, P. B., 36, 750.

- Sayed Sakr, E. (el), 211, 630.
 Saylor, H. K., 14.
 Saylor, L. W., 227.
 Sayre, C. B., 770.
 Sayre, C. R., 836.
 Scales, A. L., 361.
 Scales, F. M., 520.
 Scaramella, E. L., 812.
 Scaramuzza, L. C., 508.
 Searseth, G. D., 164, 737.
 Schaal, L. A., 351.
 Schachman, H. K., 346.
 Schaefer, A. E., 87, 668, 854.
 Schaller, F. W., 473.
 Schaller, J. A., 807.
 Schalm, O. W., 818.
 Schaub, I. O., 146.
 Schauer, L., 858.
 Schchepetil'nikova, A. M., 738.
 Schechter, M. S., 782.
 Scheid, M. V., 239, 674.
 Scheldenhelm, E. C., 90.
 Schermerhorn, L. G., 180.
 Scheuring, J. J., 241.
 Schick, B., 569.
 Schickele, R., 393.
 Schiefer, H. F., 573.
 Schiel, E., 312, 773.
 Schiff, F., 523.
 Schlenker, F. S., 455.
 Schlesinger, R. W., 387.
 Schlosberg M., 507.
 Schlutz, F. W., 133, 709.
 Schmidt, C. L. A., 732.
 Schmidt, C. T., 660.
 Schmidt, H., 35, 84, 99, 127.
 Schmidt, K. P., 217.
 Schmitt, J. B., 73, 79.
 Schneider, A. K., 583.
 Schneider, B. H., 231.
 Schneider, M. D., 242.
 Schneider, R., 586.
 Schock, A., 843.
 Schoenheimer-Glueckson, S., 36.
 Schoening, H. W., 97, 98, 683.
 Scholes, J. C., 377, 531.
 Scholl, E. E., 144.
 Schopp, R., 509.
 Schott, R. G., 513.
 Schrader, A. L., 50, 335, 340.
 Schread, J. C., 499.
 Schreiber, W. R., 54.
 Schreiber, W. T., 8.
 Schroder, W. T., 212.
 Schroeder, C. A., 482.
 Schroeder, R. A., 47, 209, 604, 630.
 Schulhoff, H. B., 597.
 Schulman, E., 13, 201.
 Schultes, R. E., 601.
 Schultz, A. S., 293, 430, 857.
 Schultz, T. W., 111, 393.
 Schultze, M. O., 412.
 Schumacher, A. E., 666.
 Schumann, T. E. W., 593.
 Schwalen, H. C., 445.
 Schwarte, L. H., 102.
 Schwartz, B., 97, 98.
 Schwartz, H., 693.
 Schwartz, L., 657.
 Schwarz, E. R., 285.
 Schwarz, R., 555, 856.
 Schwarzkopf, V., 520.
 Schweiger, L. B., 96, 427.
 Schwenk, E., 388.
 Scofield, C. S., 594.
 Scott, C. L., 718, 867.
 Scott, D. B., 585.
 Scott, D. B., Jr., 72, 501.
 Scott, D. H., 318.
 Scott, E. M., 430.
 Scott, H. M., 237.
 Scott, J. P., 750, 814.
 Scott, J. R., 422.
 Scott, V. E., 714.
 Scott, W., 271.
 Scott, W. M., 572.
 Scott Blair, G. W., 382.
 Scott Blair, M. F., 3+2.
 Scoular, F. I., 862.
 Scripture, P. N., 188.
 Scudder, H. I., 81.
 Seudi, J. V., 593.
 Scullen, H. A., 72, 795.
 Scully, J. P., 136.
 Sealock, R. R., 419.
 Searls, E. M., 220.
 Sears, E. R., 41.
 Sears, P. B., 443.
 Seath, D. M., 610, 807.
 Sebesta, E. E., 237, 802, 804.
 Sebrell, W. H., 416, 526, 565, 705.
 Secor, E. C., 542.
 Seerest, E., 144, 147, 426.
 Sedky, A., 156, 297.
 Seeley, L. E., 535.
 Seeley, M. G., 579.
 Seibold, H. R., 97.
 Selby, H. E., 393.
 Seligman, J., 184.
 Seliskar, C. E., 780.
 Sell, H. M., 29.
 Sell, O. E., 185.
 Sellers, A. F., 243.
 Sellers, W. F., 511.
 Semeniuk, W., 486.
 Semmens, C. S., 607.
 Semple, A. T., 396.
 Sen, K. C., 232, 374.
 Servais, P., 154.
 Seshan, P. A., 232, 374.
 Severin, H. H. P., 69, 70, 778, 779.
 Shackelford, R. M., 319.
 Shaban, M. S., 97, 98, 246, 679, 683.
 Shalucha, B., 26, 462.
 Shamleffer, V. J., 243.
 Shands, W. A., 499.
 Shank, D., 129.
 Shank, D. B., 755.
 Shanks, R. E., 601.
 Shapovalov, M., 101.
 Sharasuvana, S., 163.
 Sharman, B. C., 316.
 Sharp, M. A., 259.
 Sharpe, R. H., 199.
 Sharvelle, E. G., 355.
 Shaughnessy, H. J., 814.
 Shaw, A. O., 93, 514, 671.
 Shaw, B. T., 301.
 Shaw, F., 510.
 Shaw, F. R., 362.
 Shaw, J. C., 91, 672, 809.
 Shaw, J. G., 505.
 Shaw, J. H., 278.
 Shaw, J. K., 480.
 Shaw, J. N., 528.
 Shaw, L., 484.
 Shay, H., 139.
 Shea, K. G., 277.
 Shealy, A. L., 797.
 Shearin, A. E., 100.
 Shedlovsky, T., 39.
 Sheehy, E. J., 89.
 Sheets, O., 544.
 Sheffield, F. M. L., 205.
 Shelford, V. E., 652.
 Shema, B. F., 355.
 Shema, B. W., 154.
 Shepard, C. E., 373.
 Shepard, H. H., 361.
 Shepardon, C. N., 92, 99.
 Shepherd, G., 111, 393, 692.
 Shepherd, J. B., 93.
 Shepherd, M. L., 846.
 Shepherd, W. O., 232.
 Sherman, G. D., 452, 456, 487, 598.
 Sherman, H. C., 133, 407, 565.
 Sherman, M. S., 19.
 Sherwood, R. M., 35, 47, 84.
 Scheuring, J. J., 675.
 Shields, J. B., 128.
 Shier, G. R., 535, 691.
 Shiffriss, O., 66.
 Shigley, J. F., 682.
 Shillinger, J. E., 99.
 Shinn, L. A., 90, 580, 582.
 Shinnors, R. M., 562.
 Shipman, R. C., 256.
 Shirck, F. H., 77, 78.
 Shirky, S. B., 142.
 Shirley, H. L., 200.
 Shive, J. W., 645.
 Shmuck, A., 174.
 Shope, R. E., 822.
 Shorb, D. A., 98, 389, 821.
 Shorr, E., 410.
 Short, L. R., 757.
 Shortt, T. M., 653.
 Showalter, R. K., 179.
 Shrader, W. D., 15.
 Shreve, F., 25, 169.
 Shrewsbury, C. L., 514, 848.
 Stuart, C. E., 90.
 Shuey, G. A., 185.
 Shukers, C. F., 133.
 Shull, W. E., 224, 365.

- Shwachman, H., 560.
 Siderl, D. I., 301.
 Sideris, C. P., 177, 433.
 Siegler, E. H., 498.
 Sieling, D. H., 288, 737.
 Sievers, A. F., 55.
 Sievert, C. W., 734.
 Silber, R. H., 416.
 Silberschmidt, K., 485, 490.
 Silow, R. A., 606.
 Silver, W. H., 347.
 Simmons, S. J., 412.
 Simmons, S. W., 371, 509.
 Simmons, V. L., 513.
 Simms, B. T., 97.
 Simons, J. W., 109.
 Simonson, R. W., 15, 150, 302.
 Simpson, D. M., 760.
 Simpson, G. W., 499.
 Simpson, J. E., 59.
 Simpson, M. E., 39, 183, 616.
 Sims, J. A., 810.
 Sinclair, R. D., 389.
 Sinclair, W. B., 358.
 Sinden, J. W., 628.
 Singal, S. A., 280, 418, 711.
 Sinnott, E. W., 33.
 Sitapathy, N. R., 662.
 Sitton, G. R., 121.
 Sizer, I. W., 289.
 Skalling, P. E., 463.
 Skidmore, D. I., 97.
 Skinner, J. J., 453, 739.
 Skipper, H. E., 673, 807.
 Skoog, F., 462.
 Slanetz, L. W., 242.
 Slate, G. L., 196, 637.
 Slatensek, J. M., 41.
 Slater, C. S., 18, 455.
 Slatter, W. L., 520.
 Slattery, H., 830.
 Slaughenhaupt, R. R., 684.
 Sleeth, B., 649.
 Slobody, L. B., 710.
 Slosberg, H. M., 440.
 Smadel, J. E., 816.
 Smalley, H. R., 185.
 Smedley, J., 800.
 Smiles, J., 527.
 Smirnov, A., 174.
 Smit, C. J. B., 658.
 Smith, A. L., 484, 772.
 Smith, B. F., 710.
 Smith, C. A., 704.
 Smith, C. C., 498.
 Smith, C. E., 362.
 Smith, C. F., 787.
 Smith, C. M., 657.
 Smith, C. O., 359, 649.
 Smith, C. R., 289.
 Smith, C. W., 105.
 Smith, D. J. W., 244, 525.
 Smith, D. T., 705.
 Smith, E. C., 143.
 Smith, E. H., 363.
 Smith, E. L., 172.
 Smith, E. V., 626.
 Smith, F. C., 144.
 Smith, F. F., 782.
 Smith, F. H., 6, 465.
 Smith, F. L., 328.
 Smith, F. R., 96.
 Smith, F. V., 837.
 Smith, G. D., 16.
 Smith, G. E., 15, 25, 41.
 Smith, G. E. P., 637.
 Smith, G. F., 170, 290, 743.
 Smith, G. L., 361.
 Smith, G. M., 866.
 Smith, G. R., 499.
 Smith, H. H., 289, 516, 692.
 Smith, H. P., 42, 59, 105, 106, 328, 410, 705.
 Smith, H. S., 190, 229, 429, 783, 796.
 Smith, H. W., 15.
 Smith, J. B., 308.
 Smith, J. H. C., 463.
 Smith, J. M., 131, 715.
 Smith, J. T., 520.
 Smith, K. M., 485.
 Smith, L., 41, 241.
 Smith, L. E., 500.
 Smith, L. M., 786, 788.
 Smith, M. A., 59, 214.
 Smith, M. M., 372.
 Smith, M. R., 223.
 Smith, N. C., 15.
 Smith, P. H., 739, 798.
 Smith, R. C., 499, 655, 671, 783.
 Smith, R. F., 80.
 Smith, R. H., 116.
 Smith, R. L., 868.
 Smith, R. M., 83, 797.
 Smith, S. G., 566.
 Smith, S. L., 126, 147, 287.
 Smith, T. E., 645.
 Smith, T. J., 761.
 Smith, T. O., 373, 454.
 Smith, W. O., 303.
 Smith, W. P. C., 209.
 Smith, W. R., 377.
 Smith, W. W., 72, 219, 633.
 Smithcoors, J. F., 616.
 Smits, B. L., 216.
 Smock, R. M., 51, 337.
 Smuts, D. B., 231, 234, 375.
 Smythe, C. V., 727.
 Snapp, O. I., 367, 782.
 Snapp, R. R., 513.
 Snedecor, G. W., 270, 867.
 Snell, E. E., 430, 712.
 Snelling, R. O., 369.
 Snipe, J. R., 113.
 Snow, A. G., Jr., 313, 342.
 Snow, R., 171.
 Snyder, E. B., 41.
 Snyder, J. C., 633.
 Snyder, J. L. K., 846.
 Snyder, R., 98.
 Snyder, T. E., 787.
 Snyder, W. C., 350, 855.
 Soares Brandão, J., Jr., 648, 781.
 Sobel, A. E., 586.
 Sobotka, H., 592.
 Solomon, S., 204.
 Somers, I. I., 645.
 Sommer, H. H., 240, 241.
 Sooter, C. A., 217.
 Soper, F. L., 662.
 Sorensen, H. G., 341.
 Sorenson, C. J., 787.
 Soriano, S., 28.
 Sotier, A. L., 734.
 Sotola, J., 513, 847.
 Sousa, M. C. F. de, 207.
 Southwell, B. L., 85, 232.
 Southwick, L., 330, 480.
 Sowls, L. K., 360.
 Spaeth, J. N., 14.
 Sparlin, E. E., 266.
 Sparrow, A. H., 467, 609.
 Spaulding, P., 359, 650.
 Speelman, S. R., 800.
 Spencer, D. A., 35, 181, 800.
 Spencer, E. L., 26, 65.
 Spencer, G. J., 500.
 Spencer, G. R., 820.
 Spencer, J. T., 185, 429.
 Spencer, S. M., 863.
 Speroni, H. A., 494.
 Spicer, M., 718.
 Spicer, S. S., 526.
 Spiegel, H. W., 265.
 Spielman, A. A., 575.
 Spielman, M. A., 583.
 Spies, T. D., 416, 705.
 Spindler, L. A., 98, 384.
 Spoehr, H. A., 171.
 Sprague, G. F., 41, 456, 608.
 Sprague, M. A., 427.
 Sprague, R., 62.
 Springer, D. E., 253.
 Springer, E. M., 15.
 Spurr, S. H., 483.
 Squibb, R. L., 516.
 Sreenivasan, A., 150.
 Srinivasan, A. R., 318.
 Stacy, S. V., 868.
 Stader, O., 684.
 Stadler, L. J., 41.
 Stafford, W. H., 8.
 Stafford, W. T., 324.
 Stafseth, H. J., 248.
 Stage, H. H., 97.
 , R., 127.
 Stahmann, M. A., 818.
 Stair, E. C., 179, 477, 478.
 Stakman, E. C., 444.
 Stamm, E. K., 547.
 Stamm, G., 581.
 Stammer, W. C., 429.
 Standing, T. G., 698.
 Stănescu, A., 772.
 Stanford, E. H., 747.
 Stanford, J. S., 781.

- Stanler, R. Y., 305.
 Stanley, E. B., 668.
 Stanley, L., 129.
 Stanley, R. D., 586.
 Stanley, W. M., 352, 353, 354, 746.
 Stanley, W. W., 784, 785.
 Stansel, R. H., 42.
 Stanton, T. R., 484.
 Stark, C. N., 91.
 Stark, F. C., Jr., 629.
 Starr, M. P., 496.
 Starr, S. H., 288, 426.
 Starr, V. P., 735.
 Starrak, J. A., 125.
 Stateler, E. S., 439, 440.
 Staton, H. W., 190.
 Stauffer, R. S., 450.
 Stearns, C. R., Jr., 198.
 Stearns, G., 852, 853.
 Stearns, T. W., 101.
 Stebbins, F. M., 655.
 Steele, D. G., 610, 750.
 Steenbock, H., 855, 859, 860.
 Steer, H. B., 58.
 Steigmann, F., 706.
 Stein, C. D., 97, 98, 683.
 Stein, H. J., 684, 712, 799.
 Stein, W. H., 581.
 Steinbarger, M., 129.
 Steinbauer, C. E., 186, 189.
 Steinberg, A. G., 750.
 Steinberg, S. S., 143.
 Steiner, H. M., 652.
 Steinhilber, E. A., 242, 372, 512.
 Steinmetz, F. H., 652.
 Stephens, J. C., 42.
 Stephens, J. L., 473, 761.
 Stephenson, J. W., 429.
 Stepp, J. M., 402, 404.
 Sferges, A. J., 15.
 Stern, M., 416.
 Stern, R. M., 202.
 Stetten, D. J., 703.
 Steven, D. M., 414.
 Stevens, N. E., 58.
 Stevens, O. A., 623.
 Stevenson, D. D., 638.
 Stevenson, F. J., 64, 351, 622.
 Stevenson, J. A., 774.
 Stevenson, J. W., 232.
 Steward, F. C., 173.
 Stewart, A. H., 131.
 Stewart, D. F., 529.
 Stewart, G. F., 92.
 Stewart, M. A., 81, 781, 824.
 Steyn, H. P., 324.
 Stiebeling, H. K., 564.
 Stier, T. J. B., 742.
 Stierli, H., 106.
 Stiles, G. W., 97, 98, 104, 820.
 Still, E. U., 137.
 Still, G. W., 507.
 Stinson, T. B., 618.
 Stith, L. S., 124.
 Stoa, T. E., 329, 330.
 Stoddard, D. L., 775.
 Stoddard, H. L., 653.
 Stoddard, L. A., 233.
 Stoehr, J. A., 233, 798.
 Stokdyk, E. A., 536, 693.
 Stokes, W. E., 19, 622, 759.
 Stokstad, C. A., 396.
 Stoltz, P. C., 520.
 Stonaker, H. H., 426, 610.
 Stone, A., 663.
 Stone, J. T., 267.
 Stone, M. W., 361, 790.
 Stone, R. W., 175, 583, 671.
 Stone, W. E., 60.
 Storie, R. E., 595.
 Storvick, C. A., 419.
 Stott, L. H., 125.
 Stott, L. S., 142.
 Stotz, E., 153, 562.
 Stouffer, L., 717, 865.
 Stout, A. B., 181.
 Stout, G. J., 628.
 Stout, M., 729.
 Stover, D. E., 104.
 Stoves, J. L., 421.
 Strand, N. V., 124.
 Straus, F. S., 810.
 Strauss, J. L., 185.
 Street, H. R., 854.
 Street, O. E., 306, 619.
 Stringfield, G. H., 62.
 Stroman, G. N., 143.
 Strong, F. M., 136, 412, 557.
 Strong, M. D., 252.
 Struble, G. R., 367, 791.
 Struckmeyer, R. A., 15.
 Struckmeyer, B. E., 50, 314, 340.
 Stuart, L. S., 806.
 Stuart, N. W., 495.
 Stubblefield, F. M., 21.
 Stubbs, E. L., 825.
 Stuckey, H. P., 719.
 Stuckey, I. H., 43.
 Studhalter, R. A., 29.
 Studholme, A. T., 498.
 Sturgeon, E. E., 202.
 Sturgis, C. C., 523, 566.
 Sugihara, J., 11, 295, 437.
 Suit, R. F., 215.
 Sullum, V. B., 394.
 Sullivan, B., 152.
 Sullivan, R. A., 378, 379.
 Sullivan, R. R., 149.
 Sullivan, W. N., 220, 370, 499, 658.
 Summers, E. M., 210.
 Summers, W. A., 361.
 Sumner, C., 274.
 Sumner, H., 246.
 Sumner, J. B., 430.
 Suneson, C. A., 58.
 Supplee, G. C., 430.
 Sure, B., 284, 420.
 Surgeon, P. A., 657.
 Surratt, A. J., 717.
 Sutton, J. G., 107.
 Sutton, T. S., 91, 520.
 Svanhof, K., 152.
 Swales, W. E., 245, 530.
 Swallow, R. L., 667.
 Swaminathan, M., 591, 710.
 Swanback, T. R., 456.
 Swank, G. R., 791.
 Swann, M. E., 302.
 Swanson, A. F., 329, 618.
 Swanson, C. A., 457.
 Swanson, C. L. W., 164, 301.
 Swanson, C. O., 579.
 Swanson, E. W., 90.
 Swanson, L. E., 100, 245, 523, 526.
 Swanson, R. W., 675.
 Swarthout, P. A., 708.
 Swartley, J. C., 46, 457.
 Swartwout, H. G., 47, 332, 339.
 Sweany, H. P., 125.
 Sweeney, B. M., 312, 742.
 Sweet, J., 445.
 Sweetman, H. L., 365.
 Swenson, S. P., 748.
 Swenson, T. L., 458.
 Swett, P., 718.
 Swezey, J. A., 13.
 Swezey, O. H., 218.
 Swift, R. W., 558.
 Swingle, D. B., 309.
 Swingle, K. F., 853, 856.
 Swingle, M. C., 361.
 Sydenstricker, V. P., 280, 418, 711.
 Sykes, J. F., 243, 680.
 Synnott, K., 719.
 Synold, R. E., 376.
 Szego, C. M., 590.
 Tabor, P., 622, 760.
 Tager, M., 677.
 Taggart, W. G., 143, 147.
 Talbert, T. J., 483, 767.
 Talbot, J. C., 525.
 Talbot, N. A., 143.
 Talbot, N. B., 589.
 Talley, P. J., 59.
 Tanada, T., 24.
 Tank, R., 202.
 Tanquary, M. C., 83, 550.
 Tapke, V. F., 348.
 Tapley, W. T., 763.
 Tarassuk, N. P., 92, 674, 812.
 Tarkow, L., 450.
 Tartakowsky, H. S. J., 357, 430.
 Taschenberg, E. F., 785.
 Tash, L. H., 84.
 Tate, H. D., 73, 509, 790.
 Tatum, E. L., 151, 180.
 Tauter, O. E., 221, 365, 502.
 Tavernetti, J. R., 109.
 Taylor, A. E., 128.

- Taylor, A. L., 484.
 Taylor, B. R., 374, 514.
 Taylor, C. F., 215.
 Taylor, D. L., 745.
 Taylor, H. V., 130.
 Taylor, L. W., 472.
 Taylor, M. H., 394.
 Taylor, M. W., 803.
 Taylor, T. I., 586.
 Taylor, W. H., 290.
 Tedin, O., 35.
 Tehon, L. R., 651.
 Telford, C. J., 57.
 Telford, H. S., 659, 781.
 Temple, P. L., 381.
 Templeton, G. S., 497.
 Ten Eyck, A., 865.
 Tennant, J. L., 398, 403.
 Tepley, L. J., 136, 537.
 Tepper, A. E., 235.
 Teresi, J. D., 853.
 Terrell, W. G., 373.
 Terrill, C. E., 233, 518, 798.
 Tervet, I. W., 486, 640.
 Tetreau, E. D., 541.
 Tetro, R. C., 111.
 Tewalt, W. L., 521.
 Thacker, E. J., 134.
 Thaden, J. F., 271.
 Thaller, H. I., 26.
 Thalman, R. R., 84, 521.
 Tharp, M. M., 838.
 Tharp, W. H., 40.
 Thayer, J. W., Jr., 759.
 Thewlis, J. D., 537.
 Thibodeau, R., 522.
 Thimann, K. V., 312, 462.
 Thind, K. S., 204.
 Thomas, A. W., 856.
 Thomas, C. A., 628, 652, 781.
 Thomas, F. L., 73.
 Thomas, H. R., 575, 775.
 Thomas, J. M., 437, 556.
 Thomas, J. O., 281, 389.
 Thomas, M. D., 729.
 Thomas, R. C., 869.
 Thomas, W. A., 361.
 Thomas, W. D., Jr., 741.
 Thompson, A. H., 721, 832, 833.
 Thompson, H. C., 211, 629, 630.
 Thompson, J. G., 456.
 Thompson, J. N., 35, 84.
 Thompson, J. W., 339.
 Thompson, M., 718.
 Thompson, M. A., 786.
 Thompson, N. O., 536.
 Thompson, R. B., 802.
 Thompson, R. C., 9, 179, 749.
 Thompson, S. Y., 284.
 Thompson, W. C., 802.
 Thompson, W. D., Jr., 136.
 Thompson, W. L., 77.
 Thompson, W. W., 676.
 Thomsen, F. L., 694.
 Thomson, S., 419.
 Thomson, T., 721.
 Thomssen, E. G., 219.
 Thornberry, H. H., 357.
 Thorne, D. W., 186, 599.
 Thorne, G., 484.
 Thornthwaite, C. W., 298.
 Thornton, H. R., 239, 240.
 Thornton, M. H., 434.
 Thornton, N. C., 44.
 Thornton, R. P., 19.
 Thorp, F., Jr., 683.
 Thorp, J., 163.
 Thorp, W. T. S., 95, 667, 676, 681, 682.
 Throckmorton, R. I., 484, 618, 628.
 Thurston, H. W., Jr., 641, 648.
 Tiedjens, V. A., 168, 189.
 Tigert, J. J., 4.
 Tighe, L. W., 377, 518.
 Tilley, F. W., 97.
 Tilson, H. G., 330, 332.
 Timmons, F. L., 618, 762.
 Tims, E. C., 60.
 Ting, S. V., 630.
 Tingey, D. C., 429.
 Tinley, J. M., 536.
 Tippo, O., 309.
 Tisdale, H. B., 63.
 Tisdale, W. H., 147, 206, 526.
 Tiselius, A., 149.
 Tishler, M., 580.
 Titus, H., 271.
 Titus, H. W., 98, 377, 803.
 Tobey, E. R., 545, 599, 667.
 Tobgy, H. A., 607.
 Todd, F. E., 82, 510.
 Todd, J. R., 428.
 Todhunter, E. N., 410, 413, 559, 561.
 Toennies, G., 729, 730.
 Tolle, C. D., 559.
 Tolle, D. S., 721.
 Tolley, H. R., 835.
 Tolman, B., 729.
 Tomarelli, R., 711.
 Tomeo Ibarra, H. P., 418.
 Tomes, M. L., 47.
 Tompkins, P. C., 732.
 Toole, E. R., 780.
 Toth, S. J., 167, 723, 739.
 Totter, J. R., 581.
 Tovar, R., 384.
 Tower, H. E., 737.
 Townsend, G., 396.
 Townsend, J. F., 499.
 Tracy, P. H., 241, 674, 675.
 Traum, J., 97.
 Traves, C. W., 804.
 Treichler, R., 551, 731.
 Trelease, S. F., 31, 173.
 Tremontozzi, Q. A., 429.
 Trenary, O. J., 689.
 Trentin, J. L., 91, 754.
 Treessler, D. K., 129, 273, 284, 438, 442, 522, 869.
 Trewartha, G. T., 443.
 Trexler, P. C., 445.
 Triebold, H., 638.
 Trimberger, G. W., 90.
 Tripp, F., 238.
 Troelston, E. S., 110.
 Trotter, I. P., 42.
 Trout, G. M., 96, 239, 382, 675, 814.
 Trowbridge, E. A., 84.
 Trullinger, R. W., 251.
 Truog, E., 18, 22.
 Tryon, H. H., 56, 57.
 Trzcinski, S. C., 808.
 Tscherniak, A., 376.
 Tubis, M., 586.
 Tucker, C. M., 41, 59.
 Tucker, E. A., 693.
 Tucker, I. W., 589.
 Tukey, H. B., 194, 334, 335, 766.
 Tuller, A. V., 498.
 Tullis, E. C., 59.
 Turk, L. M., 543.
 Turk, R. D., 35, 99, 127.
 Turner, A. W., 674, 880.
 Turner, C. W., 34, 90, 91, 92, 94, 183, 321, 470, 471, 614, 673, 753, 754.
 Turner, D. F., 561.
 Turner, E. L., 75.
 Turner, G. T., 626.
 Turner, J. D., 373.
 Turner, N., 499, 507, 782.
 Turner, W. F., 42.
 Turney, G. J., 674.
 Turrell, F. M., 358, 783.
 Turrill, W. B., 490.
 Tyler, M. E., 813.
 Tysdal, H. M., 41, 474.
 Tyson, J., 295.
 Tytell, A. A., 770.
 Uber, F. M., 585.
 Udine, E. J., 794.
 Udurawana, S. B., 779.
 Uhrlich, J., 497.
 Ullman, S. B., 174.
 Ulyett, G. C., 511.
 Ulrich, A., 482.
 Umberger, H. J. C., 144.
 Umbreit, W. W., 310, 459.
 Underkofer, L. A., 431, 740.
 Underwood, P. C., 823.
 Unna, K., 139, 416, 418, 712.
 Uphof, J. C. T., 311.
 Upholt, W. M., 361.
 Upp, C. W., 378.
 Upshall, W. H., 195.
 Urlaub, G. S., 286.
 Urquhart, A. R., 420.
 Urquijo Landaluse, P., 216.
 Ustenko, G. P., 746.
 Utter, M. F., 309, 583.

- Vaheeduddin, S., 489.
 Vaidyanathan, S. N., 245.
 Vail, E. L., 248.
 Vail, G. E., 272, 666.
 Valle, J. E., 10, 46, 53, 762.
 Valentine, J. M., 498.
 Valentine, K. A., 143.
 Valgren, V. N., 268.
 Valteau, W. D., 205, 211, 354, 457.
 van Alstyne, L. M., 767.
 Van Blaricom, L. O., 627.
 Vance, A. M., 80.
 Vandaveer, R. L., 585.
 Van Den Ende, M., 445.
 Van Denmark, N., 91.
 Vanderford, H. B., 597.
 van der Wath, J. G., 234.
 Van Doren, A., 336.
 van Dyke, H. B., 38, 39.
 van Emden, F. I., 661.
 Van Es, L., 90, 103, 242.
 Van Gils, G. E., 149.
 VanHerrick, W., 525.
 Van Holten, P., 545.
 Van Horn, C. W., 636.
 Van Horn, L., 429.
 Van Kleeck, A., 255.
 VanLandingham, A. H., 94, 473.
 Van Lanen, J. M., 555.
 Van Liere, E. J., 410.
 Vanoni, I. E., 24.
 van Overbeek, J., 464.
 Van Roekel, H., 249, 824.
 Vansell, G. H., 83, 228, 510, 795.
 Van Slyke, D. D., 586, 587, 588, 725.
 Vanterpool, T. C., 206.
 Van Wagenen, A., 429.
 van Wormer, M. C., 295.
 van Wyk, H. P. D., 375.
 Van Zwaluwenburg, R. H., 73.
 Vardiman, P. H., 676.
 Varley, J., 243.
 Varner, R. W., 780.
 Varney, H. R., 143.
 Vass, A. F., 536.
 Vassel, B., 429, 588.
 Vaugh, M., 252.
 Vaughan, R. E., 620.
 Vaughn, E. C., 330.
 Vaughn, R. H., 358, 457, 493.
 Vawter, L. R., 679.
 Veale, P. T., 428.
 Veltmeyer, F. J., 328.
 Velez, R., 384.
 Venstrom, C., 304.
 Verbeek, W. A., 375.
 Vernon, J. J., 114.
 Verrall, A. F., 360.
 Vestal, C. M., 848.
 Vestal, E. H., 658.
 Veval, E. J., 371.
 Viado, G. B., 220.
 Vickers, V. S., 181.
 Vickers, W. A., 510.
 Vickery, H. B., 315, 581.
 Vigneaud, V. du, 9, 581, 582, 702, 705, 711, 724.
 Viljoen, P. R., 867.
 Villamil, A. R., 579.
 Vincent, J. M., 741.
 Vine, H., 451.
 Vinson, C. G., 47, 59, 313, 861.
 Visher, S. S., 12, 158, 445.
 Vivino, A. E., 550.
 Voelker, S. W., 399.
 Vogel, O. A., 609.
 Volin, L., 123.
 Volk, G. M., 19.
 Volk, G. W., 456.
 Vollmer, H., 569.
 Voris, A. L., 143.
 Voris, L., 134, 558.
 Voss, J. G., 380, 570.
 Vrydagh, J. M., 787.
 Vutz, W., 256.
 Waddell, D. B., 660.
 Wade, B. L., 67, 191, 627.
 Wadleigh, C. H., 40.
 Wadsworth, F. H., 342.
 Wager, V. A., 494, 495.
 Wagers, R. P., 676.
 Wain, R. L., 654.
 Wainman, P., 755.
 Waisman, H. A., 153.
 Wakeland, C., 224.
 Waksman, S. A., 26, 451, 459, 580, 597, 740.
 Wald, G., 130.
 Walden, D. C., 373.
 Walkden, H. H., 659.
 Walker, E. A., 640.
 Walker, E. H., 169.
 Walker, H. A., 803.
 Walker, H. B., 827.
 Walker, H. G., 498, 782.
 Walker, J. C., 212.
 Walker, L. S., 85, 454.
 Walker, R. H., 720.
 Wall, R. F., 478.
 Wallace, A., 599.
 Wallace, F. N., 227.
 Wallace, H. A., 869.
 Wallace, H. A. H., 771.
 Wallace, P. P., 228, 499.
 Walley, G. S., 511.
 Wallis, G. C., 90, 566.
 Walster, H. L., 330, 620, 720.
 Walter, E. D., 428.
 Walters, W. H., 706.
 Walton, G. P., 586.
 Wanderstock, J. J., 513.
 Ward, C. K., 721.
 Ward, H. H., 436.
 Wardlaw, C. W., 32.
 Ware, L. M., 185.
 Waring, W. S., 739.
 Warrington, K., 48.
 Warner, E. D., 705.
 Warner, J. D., 329.
 Warren, D. C., 320, 325, 612, 614, 666.
 Warwick, B. L., 35, 84.
 Warwick, E. J., 610.
 Washburn, L. E., 92.
 Washburn, R. G., 91, 809.
 Washko, J. B., 772.
 Wasser, C. H., 757.
 Waters, H. A., 782.
 Waters, N. F., 98.
 Wath, J. G. van der, 234.
 Watkins, 59.
 Watkins, D. W., 144.
 Watkins, T. C., 782.
 Watkins, W. G., 83.
 Watson, A. E., 398.
 Watson, C. J., 232.
 Watson, D. W., 816.
 Watson, E. A., 247, 530, 684, 817.
 Watson, E. B., 656.
 Watson, H. M. S., 470.
 Watson, J. A. S., 832.
 Watson, J. R., 222, 503.
 Watts, V. M., 46.
 Waugh, F. A., 868.
 Weakly, H. E., 105.
 Weatherby, E. J., 91, 751.
 Weatherwax, P., 126.
 Weaver, C. H., 100.
 Weaver, D. L., 667.
 Weaver, E., 808.
 Weaver, H., 639.
 Weaver, J. E., 744.
 Weaver, J. G., 342.
 Weaver, J. W., Jr., 257.
 Weaver, L., 317.
 Weaver, L. A., 34, 84.
 Weaver, R., 626.
 Webb, J. L., 228.
 Webb, W. L., 217.
 Webber, H. J., 636.
 Webber, R. T., 782.
 Weber, A. D., 666.
 Webster, L. T., 390.
 Webster, O. J., 41.
 Webster, R. L., 81, 369, 792.
 Weddell, D. J., 496.
 Weckley, C. E., Jr., 377.
 Weetman, L. M., 41.
 Wegner, M. I., 438.
 Wehr, E. E., 98, 384.
 Wehrle, W., 607.
 Wehrwein, G. S., 125.
 Welbel, R. O., 473.
 Welchert, C. K., 40, 470, 471.
 Weidenhammer, L. E., 421.
 Wehling, R. M., 759.
 Well, J., 144.
 Welmer, J. L., 499.
 Weir, W. W., 304.
 Weirether, F. J., 819.
 Welser, H. B., 149.
 Welser, H. H., 813.

- Weiss, F., 58, 202, 848, 640.
 Weissberger, L. H., 438.
 Weitekamp, N. E., 848.
 Weitzell, E. C., 395.
 Welch, F. J., 142, 536, 755.
 Welch, H., 527, 663.
 Welden, W. C., 269.
 Weldon, M. D., 15.
 Weldy, M. L., 682.
 Wellborn, F. L., 185.
 Weller, D. M., 317.
 Wellhausen, E. J., 411, 473, 640.
 Wellman, H. R., 536.
 Wellman, R. H., 641, 770.
 Wells, B. W., 311.
 Wells, M. W., 444, 445.
 Wells, R. W., 98.
 Wells, W. F., 444, 445.
 Welsch, M., 451, 600.
 Welsh, M. F., 357.
 Wendland, R. T., 431.
 Wene, G., 783.
 Wenger, L. E., 618.
 Wenzel, L. K., 106, 828.
 Werch, S. C., 569.
 Werkman, C. H., 309, 583, 739.
 Werner, G., 808.
 Werner, H. O., 41, 47.
 Wernham, C. C., 487, 619, 641.
 West, A., 375.
 West, C. H., 536.
 West, H. O., 670.
 West, R. M., 245.
 Westerman, B. D., 701.
 Westfall, R. J., 90.
 Weston, W. H., 310.
 Westover, H. L., 474.
 Westover, K. C., 631.
 Westveld, M., 483.
 Weybrew, J. A., 721.
 Whalin, C. V., 403.
 Whalley, H. K., 433.
 Whatley, J. A., Jr., 182.
 Wheeler, C. M., 796.
 Wheeler, E. H., 227, 785.
 Wheeler, E. J., 691.
 Wheeler, L. A., 124.
 Wheeler, N. H., 75.
 Wheeler, S. M., 444.
 Wheeting, L. C., 767.
 Whelan, D. B., 659.
 Whetten, N. L., 696.
 Whiffen, A. J., 486.
 Whipple, C. E., 540.
 Whitacre, J., 127, 275.
 Whitacre, W. R., 540, 628, 700.
 Whitaker, T. W., 49, 354, 646, 764.
 Whitcomb, W. O., 618.
 White, A., 19, 725.
 White, A. G. C., 175, 705.
 White, A. H., 814.
 White, B. S., Jr., 842.
 White, D. G., 47, 632.
 White, G. C., 672.
 White, H. A., 402.
 White, J. H., 370.
 White, J. W., 595, 619.
 White, J. W., Jr., 292, 435, 436.
 White, N. H., 773.
 White, O. E., 26.
 White, P. R., 25, 204, 463, 774.
 White, R. L., 412, 420.
 White, R. T., 504.
 White, W. E., 638.
 White, W. H., 516.
 Whitehead, E. L., 308, 315, 587.
 Whitehead, W. E., 502.
 Whitehurst, V. E., Jr., 245.
 Whitfield, C. J., 453.
 Whitford, A. C., 286, 866.
 Whitlock, H. V., 217.
 Whitlock, J. H., 389, 676, 682, 823, 824.
 Whitman, W., 620.
 Whitnah, C. H., 671, 721.
 Whitney, R., 184.
 Whitson, D., 376, 517.
 Whitt, D. M., 164.
 Whitten, R. R., 782.
 Whittier, E. O., 96.
 Wiant, D. E., 690.
 Wiant, J. S., 211.
 Wickard, C. R., 1, 97.
 Wickenden, W. E., 2.
 Wickline, W. L., 722.
 Wiegand, E. H., 442.
 Wiehl, D. G., 547.
 Wiesner, B. P., 177.
 Wiggins, C. C., 47.
 Wigglesworth, V. B., 363.
 Wight, A. E., 97, 814.
 Wilbur, D. A., 655, 783.
 Wilbur, J. W., 90, 809.
 Wilke, H. L., 517.
 Wilcox, A., 662.
 Wilcox, E. B., 273.
 Wilcox, F. R., 536.
 Wilcox, J. C., 632.
 Wilcox, M. S., 493.
 Wild, C., 143.
 Wilde, M. O., 550.
 Wilde, S. A., 452.
 Wilder, R. M., 410, 565, 710.
 Wilder, T. S., 444.
 Wildman, J. D., 585.
 Wildman, S. G., 213.
 Wildon, C. E., 199.
 Wilgus, H. S., Jr., 721.
 Wilhelm, L. A., 237.
 Wilk, I., 861.
 Wilkes, R., 834.
 Wilkins, T. E., 266.
 Wilkins, W., 714.
 Wilkins, W. H., 601.
 Will, H. C., 664.
 Willaman, J. J., 296.
 Willard, A. C., 144.
 Willems, E., 843.
 Willett, E. L., 184.
 William, O. S., 374.
 Williams, A. G., 378.
 Williams, C. S., 217.
 Williams, D. E., 85.
 Williams, E. B., 809.
 Williams, F. X., 74.
 Williams, H. H., 846.
 Williams, J. O., 800.
 Williams, J. S., 455.
 Williams, O. B., 291, 292, 700.
 Williams, O. E., 383.
 Williams, Q., 514.
 Williams, R. B., 105.
 Williams, R. D., 138, 710.
 Williams, R. J., 9, 705, 712.
 Williams, R. M., 618, 628, 666, 667.
 Williams, R. R., 134, 414, 710, 733.
 Williams, W. A., 261.
 Williams, W. L., 324.
 Williamson, C. E., 345.
 Williamson, D. D., 864.
 Williamson, L. J., 718.
 Williamson, R., 845.
 Willier, B. H., 410.
 Willis, H. H., 869.
 Willott, W. H., 422.
 Willson, F. S., 618, 666.
 Willstaedt, H., 281.
 Wilm, H. G., 445, 639.
 Wilsie, C. P., 622.
 Wilson, D. A. W., 444.
 Wilson, D. B., 662.
 Wilson, E. E., 357, 492.
 Wilson, G. F., 654.
 Wilson, H. L., 520.
 Wilson, H. F., 221, 365, 657.
 Wilson, I. C., 126.
 Wilson, J. B., 586.
 Wilson, J. K., 621, 630.
 Wilson, J. W., 225.
 Wilson, M. H., 444.
 Wilson, M. L., 1.
 Wilson, P., 693.
 Wilson, P. W., 305, 430.
 Wilson, R. D., 207.
 Wilson, R. H., 281.
 Wilson, R. V., 440.
 Wilson, U., 444.
 Wilson, W. F., 341.
 Wilson, W. K., 235.
 Wilson, W. T., 14, 115.
 Wiltgen, V. H., 550.
 Wimsatt, W. A., 324.
 Winchester, C. F., 34.
 Winger, R. N., 819.
 Wingo, C. W., 72, 219.
 Winkler, A., 778.
 Winkler, A. J., 54.
 Winkler, W. O., 586.

- Winston, J. R., 197.
 Winter, A. R., 379.
 Winter, J. D., 700.
 Winterberg, S. H., 456.
 Winterkorn, H. F., 450.
 Winters, L. M., 181, 184, 394, 516, 610.
 Wintrobe, M. M., 684, 799.
 Wipf, L., 103, 319.
 Wirt, F. A., 256.
 Wirth, J. C., 430.
 Wirth, W. W., 509.
 Wise, B., 384, 525.
 Wise, G. H., 94, 523.
 Wisnicky, W., 103.
 With, T. K., 153, 413.
 Withrow, R. B., 763.
 Witman, E. D., 781, 782.
 Witt, L. W., 694.
 Witz, R. L., 428, 692.
 Witzberger, C. M., 710.
 Wodehouse, R. P., 444.
 Woelffer, E. A., 238.
 Woerz, J. A., 776.
 Wokes, F., 862.
 Wolbach, S. B., 136.
 Wolcott, G. N., 500.
 Wolf, A., 585.
 Wolf, B., 192.
 Wolf, E. A., 764.
 Wolf, H. W., 140, 317, 513.
 Wolfe, A. B., 393.
 Wolfe, H. S., 197.
 Wolfe, W. G., 500.
 Wolfenbarger, D. O., 650.
 Wolochow, H., 239, 240.
 Wood, A., 728.
 Wood, A. J., 458, 600.
 Wood, E. H., 590.
 Wood, F. W., 245, 814.
 Wood, H. G., 583.
 Wood, J. F., 42, 47.
 Wood, J. W., 657.
 Wood, L. K., 23.
 Woodburn, R., 17, 736.
 Woodbury, G. W., 333.
 Woodcock, A. H., 516.
 Woodhouse, C. A., 99.
 Woodhouse, W. W., Jr., 619.
 Woodmansee, C. W., 590.
 Woodrow, A. W., 82, 795.
 Woodruff, C. M., 15.
 Woodruff, H. B., 451, 459.
 Woodruff, R. N., 862.
 Woods, G. M., 245, 814.
 Woods, H. J., 422.
 Woods, M. W., 646, 769.
 Woodside, A. M., 506.
 Woodward, E. G., 144.
 Woodward, T. E., 93, 116.
 Woodworth, C. E., 78.
 Woodworth, H. C., 539.
 Wooley, J. C., 84, 105, 835.
 Woolley, D. W., 703, 705, 744.
 Woolley, G. W., 750.
 Wooster, J. L., 124, 265.
 Work, P., 334.
 Work, S. H., 722.
 Working, E. B., 177, 579, 868.
 Working, H., 393, 536.
 Works, G. A., 543.
 Wormald, H., 214, 775, 777.
 Wortley, H. N., 143, 648, 652.
 Wortis, H., 416.
 Worzella, W. W., 608.
 Wright, A. A., 654.
 Wright, A. H., 654.
 Wright, E., 59, 71.
 Wright, L. E., 196.
 Wright, M. E., 124.
 Wright, M. H., 524.
 Wright, M. M., 237.
 Wright, N. C., 546.
 Wright, S., 469.
 Wrigley, P. I., 638.
 Wyche, R. H., 42, 47, 84.
 Wyckoff, S. N., 536.
 Wylie, C. C., 298.
 Wylie, C. E., 238, 807.
 Wylie, K. H., 123, 540, 840.
 Wyman, L. C., 460.
 Wynd, F. L., 624.
 Yaglou, C. P., 444.
 Yanamura, H. Y., 678.
 Yarnell, S. H., 47, 199, 627, 849.
 Yates, F., 367.
 Yatzynina, K. N., 213.
 Yeager, A. F., 331.
 Yesair, J., 291.
 Yiengst, M. J., 99.
 York, H. A., 722.
 Yothers, M. A., 72, 369.
 Youmans, J. B., 132.
 Young, A. A., 298.
 Young, A. L., 833.
 Young, G. V., 722.
 Young, H. C., 345.
 Young, H. C., Jr., 355.
 Young, J. O., 335.
 Young, K., 271.
 Young, M. D., 662.
 Young, M. T., 362, 368.
 Young, P. A., 59.
 Young, V. H., 59, 484, 768.
 Youngs, F. O., 595.
 Younle, A. R., 249.
 Yu, C. P., 606.
 Yudkin, S., 552.
 Yunker, T. G., 360.
 Yung, F. D., 105, 379.
 Yust, H. R., 72, 76, 366, 782, 788, 789.
 Zahl, P. A., 677.
 Zahnley, J. W., 330, 618.
 Zander, D. V., 472.
 Zappe, M. P., 499.
 Zechmeister, L., 430.
 Zehngraff, P., 200.
 Zeller, J. H., 513.
 Zeller, S. M., 777.
 Zentmyer, G. A., 650.
 Zevin, S., 706.
 Zichis, J., 814.
 Ziegler, P. T., 666.
 Zimmerman, E. C., 362.
 Zimmerman, F. L., 142.
 Zimmerman, P. W., 174, 479.
 Zingg, A. W., 594.
 Zink, F. J., 533, 830.
 Zipkin, I., 681.
 Zitin, B., 727, 728.
 Zitrin, A., 751.
 Zittle, C. A., 323, 727, 728.
 ZoBell, C. E., 26, 309, 444.
 Zollikofer, E., 240.
 Zon, R., 638.
 Zook, L. L., 41.
 Zscheile, F. P., 8, 202, 434, 435, 436, 856.
 Zuill, F., 144, 513.
 Zwillling, E., 750.

INDEX OF SUBJECTS

NOTE—The abbreviations "Ala.", "Conn. [New Haven]", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P.R.U." to those of the experiment stations in Hawaii and Puerto Rico (University station); and "U.S.D.A." to those of this Department.

- AAA pasture allowances under new program, Miss. 186.
- Abacá fiber industry, establishment in Central America, U.S.D.A. 617.
- Abattoir, Baton Rouge, relation to retail meat supply and production and marketing problems, La. 122.
- Abortion, *see* Bang's disease and *Brucella abortus*.
- Acacia berlandieri*, toxicity, feeding tests to determine, Tex. 99.
- Acanthoscelides obtectus*, *see* Bean weevil.
- Accidents, prevention on farms and in homes, U.S.D.A. 267.
- Accounting, farm, *see* Farm accounts.
- Acetic acid and glucose as nutrient in feeds, comparison, 90.
- Acetic acid, enzymatic formation from acetoacetic acid, 583.
- Acetoacetic acid, acid-splitting reaction of, 583.
- Acetobacter suboxydans*, growth factor for, 740.
- Achondroplasia, recessive, new type in cattle, 611.
- Achras zapota* response in latex yield to wounding by ibidem method of tapping, 463.
- Achromobacter harveyi*, studies, 457.
- Achromotrichia, nutritional, in rats, 130.
- Acids—
amino, *see* Amino acids.
fatty, *see* Fatty acids.
- Acorns, cause of olive-colored yolks, 519.
- Aorobasis caryae*, *see* Pecan nut casebearer.
- Acrylonitrile, toxicity against confused flour beetle, 505.
- Actenodes* spp., revision, U.S.D.A. 228.
- Actinobacillosis and actinomycosis, diagnosis, 679.
- Actinomycetes—
antibioticus, chemical nature of actinomycin produced by, 580.
viridochromogenus, thiamin production by, 458.
- Actinomycetes—
antagonistic, distribution in nature, 451.
bacteriostatic and bacteriolytic properties, 600.
colony variation under constant conditions, 19.
in inland lakes, 310.
soil, medium for rapid cultivation, 305.
Actinomycin A isolated from *Actinomyces antibioticus*, chemical nature, 580.
Actinomycosis and actinobacillosis, diagnosis, 679.
- Adelphocoris*—
rapidus, *see* Plant bug, rapid.
superbus on cotton, control by dusts, 504.
superbus studies, Tex. 73.
- Adhesive for plywood, cottonseed protein for, Miss. 154.
- Adrenals, assay for lactogenic hormone, 754.
- Acrobacter*—
aerogenes associated with slime, disinfectants for, relative toxicity, 154.
spp. in factory-packed ice cream, 96.
- Aerobiology, treatise, 444.
- Agar, reclaiming for bacteriological use, 26.
- Agar recovery, simple procedure for, 600.
- Agranulocytosis in rats, prevention and treatment, 526.
- Agrarian conflicts in New York and the American Revolution, 697.
- Agricultural—
adjustments—
for Chase Co. and area analysis, Kans. 537.
in Nemaha Co. and area analysis, Kans. 397.
colleges, *see* specific colleges.
committees, British county war, U.S.D.A. 540.
cooperation, trends in, 536, 693.
credit—
agencies in a cotton county, Tenn. 120.
in Canada, U.S.D.A. 265.

Agricultural Continued.

credit—continued.

in cotton type-of-farming areas,
Tenn. 120.

in Denmark, U.S.D.A. 265.

in Germany, U.S.D.A. 265.

principles and practice, 264.

engineering, *see* Engineering.

equipment—

conservation in wartime, Mich. 827.

program, Nation-wide, 831.

experiment stations, *see* Experiment
stations.

extension, *see* Extension.

finance, principles and practice of farm
credit, 264.

income and export market, 1910 1940,
693.

industry in South Africa and new con-
ditions, 867.

journals, new, 430.

labor, *see* Farm Labor and Labor.

land use program for State, development,
Kans. 693.

machinery—

and equipment, estimating needs,
690.

and equipment, studies, U.S.D.A.
827.

duty of, 690.

gearing to war effort, 256.

in Britain's food production effort,
107, 832.

rationing of, 831.

rental rates for, 831.

rubber-tired equipment of, U.S.D.A.
108.

suitable for southern farms, 256.

wartime allocation, 830.

wartime distribution in United
Kingdom, U.S.D.A. 124.

Marketing Administration, report, U.S.
D.A. 841.

output control in wartime, 536.

policy, schisms in, shift toward human
welfare, 393.

price policies in wartime, 393, 536.

prices, bases for control, 692.

problem of Venezuela, U.S.D.A. 123.

production—

and nonagricultural employment in
Rhode Island, R.I. 263.

expanded, Bolivian progress toward,
U.S.D.A. 696.

expansion, obstacles to, 393.

goals, Miss. 537.

goals in 1942 and establishing those
for 1943, U.S.D.A. 835.

in 1943, forecast of changes in,
Calif. 836.

problems, wartime, station research
applied to, 722.

products—

marketing, *see* Marketing.

prices in Iowa, Iowa 124.

prices, indexes of prices and pur-
chasing power, Okla. 261.

Agricultural—Continued.

relations with Mexico, U.S.D.A. 540.

research—*see also* Research.

dividends from investment of funds
in, Utah 720.

in wartime, value, Mont. 719.

residues, plastics from, U.S.D.A. 723.

resources of Australia, U.S.D.A. 839.

resources of Madagascar, U.S.D.A. 405.

resources of Mozambique, U.S.D.A. 405.

sciences, Inter-American Institute of,
576, 869.

situation and tables on prices, Okla. 693.

statistics, developments in sampling for,
270.

Statistics, proposal for revision, 393.

surpluses, disposal of, 393.

tenancy, *see* Farm tenancy, Farm tenure,
and Land tenure.

Agriculture—

and conservation, papers on, 287.

as commercial industry comparable to
other branches of economy, 393.

changes in Arkansas, insect problems re-
sulting from, 362.

climatology in service of, U.S.D.A. 298.

Department of, *see* United States De-
partment of Agriculture.

effects of American-Canadian trade reci-
procity on, 693.

electricity in, *see* Electric.

in Australia and war effort, U.S.D.A.
840.

in Colombia, U.S.D.A. 840.

in Cumberland Co., significant changes
in, Tenn. 262.

in Kentucky, trends, Ky. 838.

in 1917-18, price administration, pri-
orities, and conservation of supplies

affecting, U.S.D.A. 400.

in the Americas, U.S.D.A. 768.

in Tucumán during last 60 years, prog-
ress, 867.

in Yakima Valley, economic conditions
and problems, Wash. 262.

mathematics in, 272.

of West, effect of post-war reclamation
expansion, 536.

permanent, textbook, 271.

rescue programs and managed agricul-
tural progress, 393.

scale of operations in, 393.

scale of operations in, comment on and
rejoinder, 693.

second Inter-American Conference of,
U.S.D.A. 124.

social economics of, 405.

special research in, U.S.D.A. 723.

trends in Providence and Bristol Coun-
ties, R.I. 394, 397.

victory program of, relation to drain-
age, 107.

vocational, and the fieldman, 520.

vocational, supervised practice in, Iowa
125.

war program in, engineering contribu-
tion to, 252.

Agriculture—Continued.

- wartime, problems in planning, 536.
- western, in wartime and after, papers on, 536.

Agrius arcuatus torquatus, notes, 219.

Agriotes obscurus, biology, 654.

Agriotes sputator, biology, 654.

Agrobacterium tumefaciens n.g. and n.comb., proposed name, 457.

Agrotis orthogonia, see Cutworm, pale western.

Aircraft decay, U.S.D.A. 640.

Airplane wood from Sitka spruce, importance of fungi and defects in handling, 780.

Alabama argillacea, see Cotton leafworm.

Alaska Stations report, 719.

Albinism in Virginia deer, 472.

Albumin—

- alkali-treated bovine serum, administration to man and animals, effect, 241.
- egg, injury in man, cure with biotin, 418, 711.
- egg, injury in rats, cure by avidin, 283.
- egg, ovomucin gel of, characteristics, 805.

Alcaligenes genus—

- difficulties in defining, 599.
- validity, 457.

Alcohol from citrus-waste liquors, U.S.D.A. 723.

Ale, vitamin B complex in, 856.

Alfalfa—

- and bromegrass mixture, continuous v. rotation grazing with ewes and lambs, 187.

and bromegrass pastures, sheep grazing methods, Nebr. 42.

bacterial wilt and virus dwarf, 343.

biological value for dairy heifers, 90.

boron fertilization, 758.

breeding, Kans. 618, Nebr. 41, U.S.D.A. 616.

culture tests, Mont. 619.

effect of cutting systems on, [Conn.] Storrs 758.

efficiency of phosphate fertilizers on calcareous soil for, 758.

fertilizer requirements, N.H. 188.

fertilizer tests, Okla. 756, R.I. 326.

for detecting boron deficiency in soil, U.S.D.A. 504.

for fattening sheep, 375.

for green manure, Utah 186.

for pasture and hay, seeding practices, and seeds, N.J. 187.

grazing studies, Mont. 619.

ground, for brood sows, Mich 668.

hay, availability of carotene compared with carotene in oil, 90.

hay, barn curing experiments, Ohio 392.

hay, nutritive value, 93.

hay, vitamin A and D potency, 90.

inoculating with pure cultures of legume nodule organism in Argentina, 312.

insects, Kans. 655.

leafhopper control by delayed cutting, N.C. 473.

Alfalfa—Continued.

meal in turkey rations, Utah 670.

meals, carotene content, Mass. 798.

nitrogen utilization in young sheep, effect of cystine supplementation, 234.

nurseries, uniform, U.S.D.A. 474.

pasture, effect on beef cattle, Nebr. 84.

pasturing with hogs, Nebr. 41.

plant pigments, use of, U.S.D.A. 723.

production, B as essential for, N.C. 473.

root- and crown-rotting fungi in Alberta, varietal resistance, 349.

rust resistance of species and varieties, 487.

seed, legume bugs in, insecticidal control, 365.

seed, *Lygus* bugs in, insecticidal tests for, 787.

seed production, Oreg. 619.

seed production, effect of boron, 620.

silage, see Silage.

stem nematode, 343.

studies, Kans. 618.

superior varieties or strains grown by station, Oreg. 619.

varieties, determining hay yields, 759.

varieties, yield and winter injury, Pa. 619.

variety tests, Alaska 617, Kans. 618, Nebr. 41, Tex. 42.

vitamin A and carotene values, U.S.D.A. 670.

weevil studies, Oreg. 655.

white root rot control, 343.

wilt-resistant variety, A-136, U.S.D.A. 616.

wilt-resistant variety, new, Utah 620.

yellow-flowered, hardiness, growth habit, and seed production, Alaska 617.

yellow, effect of borax and potash, Tenn. 772.

Algae of British soils, ecological and taxonomic study, 602.

Algae, photosynthesis of, 316.

Alkaline soils, loss of ammonia from ammonium sulfate applied to, 597.

Allendecalcizaria, systematics of, 659.

Allodermomyssus sanguineus, annoying to man, 796.

Allotropa utilis, parasite of apple mealybug, 223.

Alternaria—

early blight of tomatoes, breeding for resistance to, Tex. 59.

fungus and new mite on citrus, 230.

passiflorae control, 216.

tenuis, cause of sunflower leaf spot, 211.

Alyceclover—

fertilizer tests, Ga. 617.

production test, Ga.Coastal Plain, 325.

tests, Miss. 186.

Amauronematus asaleae in greenhouse at Collingale, 664.

Amazon fly, Sao Paulo strain, liberations and shipments to Louisiana, P.R. 655.

Amblyomma gertschii n.sp., notes, 512.

- Ambrosia beetles on fruit trees in California,** 362.
- Ambrosia trifida*, sex expression in, effect of photoperiod,** 32.
- Ambush bug, economic status, appraisal.** 75.
- American—**
 Dairy Science Association, student chapter, 808.
 Phytopathological Society, Pacific division, meeting, 58.
 Scientific Congress proceedings, 287.
- Amino acids—**
 aromatic sulfonic acids as reagents for, 581.
 contribution to normal nutrition, 277.
 effect of light on, N.Y.State 149.
 free, carboxyl groups in gasometric determination, 588.
 free, determination by titration of carbon dioxide, 588.
 in hemoglobin formation, 704.
 reactions studied by methods of non-aqueous titrimetry, 729.
- p-Aminobenzoic acid—**
 growth factor for *Acetobacter suboxydans*, 740.
 role in reproduction and lactation in rat, 420.
- Ammonia—**
 conductometric determination, 729.
 in desert soils, microbiological oxidation, Ariz. 451.
- Ammonium sulfate applied to alkaline soils, loss of ammonia from,** 597.
- Amoeba, unidentified, parasite of squirrel,** 497.
- Amperometric titrations,** 290.
- Amphimallon majalis*, importance and control,** N.Y.State 785.
- Amphorophora—**
 osborni n.sp., description, 366.
 ribiella, new aphid associated with, on black currant, 366.
- Ampulex compressa*, biological notes,** 74.
- Anabaena cylindrica*, N fixation by,** 312.
- Anabrus simplex*, see Cricket, Mormon.**
- Anaerobic—**
 bacilli, flagella staining, 309.
 species, facultatively anaerobic, metabolism of, 457.
- Anagrus epos*, effect of dormant sprays on,** 510.
- Analysis, qualitative semimicro, Barber pressure bulb method,** 586.
- Analytical methods, referee's reports,** 585.
- Ananas* genus, taxonomic study,** 25.
- Anaplasma—**
 marginale, transmission experiments with biting flies, 217.
 nature of, 99.
- Anaplasmosis—**
 carriers of, Okla. 783.
 cases, occurrence of *Bartonella* in, 384.
 in cattle, Tex. 99, U.S.D.A. 98.
 of cow, fowl tick as vector, 826.
 studies, U.S.D.A. 676, Kans. 676.
- Anasa tristis*, see Squash bug.**
- Anastrepha—**
 ludens, see Fruitfly, Mexican.
 new species and notes, 662.
- Ancylis comptana fragariae*, see Strawberry leaf roller.**
- Ancylostoma caninum*, anthelmintic efficiency of Ficin against,** 247.
- Androgen—**
 assay by the chick comb method, technic, 184.
 ovarian, source of, in mice. 472.
 treatment of castrated female rats, mating behavior in, 752.
- Androgenic activity, variables affecting estimation,** 183.
- Anemia—**
 equine infectious, U.S.D.A. 97.
 hemorrhagic, in dogs, 854.
 hypochromic, relation to multiple dietary deficiencies, 277.
 in chicks, Mo. 84.
 infectious, U.S.D.A. 676.
 infectious, equine, congenital transmission, 683.
 inherited macrocytic in mice, 612.
 nutritional, of rats, use of radioactive copper in, 412.
 pernicious, pantothenic acid absorption in, 566.
- Anemone coronaria* infection with *Tranzschelia pruni-sponosae*,** 495.
- Angiopteria evecta* petiole, undifferentiated cells in, shapes of,** 746.
- Angoumois grain moth on rice, U.S.D.A.** 73.
- Animal(s)—see also Cattle, Livestock, Mammals, Sheep, etc.**
 and man, bacterial infections and parasites common to, U.S.D.A. 97.
 benefits from forest fungi and insects, 359.
 body areas, fiber diameter studies, 513.
 deficiencies, relation to soil composition, Tex. 21.
 diseases—see also specific diseases.
 and insect control, fundamentals of, U.S.D.A. 97.
 and parasites, 523.
 and parasites in Great Britain, 384.
 control, 523.
 control in Great Britain, wartime, 814.
 new host-parasite records, 384.
 parasitic, report of committee on, 814.
 relation to nutrition, 520.
 studies, U.S.D.A. 676.
 transmissible, report of committee on, 814.
 domestic, growth and development, Mo. 320.
 farm, breeding and improvement, 468.
 farm, damage to reproduction by vitamin A deficiencies, Ohio 318.
 farm, diseases, relation to nutrition, 241.

Animal(s)—Continued.

- farm, nutritional diseases, U.S.D.A. 97.
 fats, *see* Fat(s).
 herbivorous, role of vitamin B complex in nutrition, Tex. 85.
 husbandry experiments, design, 513.
 husbandry group, committee on policy, report, 797.
 husbandry in India, 85.
 imported, and products, inspection and quarantine, U.S.D.A. 676.
 industry in Tucumán during last 60 years, progress, 867.
 normal and bloated, ruminal gases in, 90.
 nutrition—
 potassium in, 134.
 relation to disease in farm animals, 241.
 role of carotene in, 232, 374.
 zinc in, 456.
 parasites, *see* Parasites.
 photosensitization of, Tex. 99.
 preparation of carcasses for chemical analysis, 729.
 production in post-war world, 796.
 proteins, nutritive value, 231.
 sanitation and disease control, 523.
 small, autopsy examinations of, R.I. 384.
- Anopheles*—*see also* Malaria and Mosquito(es).
 breeding along irrigation canals, Paris green for control, automatic distribution, 657.
 larval, identification in Georgia, 370.
- Anoxia, relation to visual system, 130.
- Ant(s)—
 as predators of screwworm larvae, 795.
 control, Nebr. 73.
 invasion of houses by, 654.
 of Utah, 664.
 poisons, sweetened, effect on bees, 510.
 termites, and plants, ecological relations, 311.
 white, *see* Termite(s).
- Antestia* in Kenya, food and feeding habits, 658.
- Anthelmintics, bio-assay technic for, 823.
- Anthrenus*—
eugeni, *see* Pepper weevil.
grandis, *see* Boll weevil.
scutellaris, *see* Plum gougher.
signatus, *see* Strawberry weevil.
- Anthrax—
 case reviews and results of use of sulfonamide compounds, 815.
 studies, U.S.D.A. 97, 676.
 symptomatic, *see* Blackleg.
- Anthrenus scrophulariae*, *see* Carpet beetle.
- Anticarsia gemmatilis*, *see* Velvetbean caterpillar.
- Antricola* new genus, notes, 512.
- Antultrin-S injection in pregnant rats and rabbits, fetal survival following, 751.
- Anuraphis roseus*, *see* Apple aphid, rosy.
- Aonidiella*—
aurantii, *see* Red scale, California.
citrina, *see* Yellow scale.

Aphanomyces eutiches on peas, N.Y.State 66.
Aphanotus parallelus in insect nests, 73.

Aphid(s)—

- coccinellid predator of, establishment, P.R. 653.
 control on collards, 782.
 control, reduced spray concentrations for, N.Y.State 786.
 guide to phylogeny, 658.
 living, staining, simple method, 658.
 redbud, studies, Kans. 655.
 transmission of narcissus mosaic virus by, 495.
 woolly, *see* Apple aphid, woolly.

Aphidius matricariae, bionomics, 371.

Aphis—

- abbreviata*, winter hosts in New Brunswick, 223.
fabae, summer host, 503.
gossypii, *see* Cotton aphid.
maidis, *see* Corn leaf aphid.
rhumini, transmission of potato virus Y by, 210.

Aphyus spp., effect of dormant sprays on, 511.

Aphytis mytilaspidis, effect of dormant sprays on, 510.

Apiary(ies)—

- inspection, Conn.[New Haven] 499.
 location, Okla. 783.

Aplanobacter michiganense, breeding for tomato resistance to, 213.

Apparatus --

- for collecting salt particles from atmosphere, 177.
 for determination of carbon in soils, 728.
 for production of artificial frost injury to trees, 29.
 Lundegård's, construction and use, 433.

Apple(s)—

- alternate bearing in, 479.
 and cider jelly, preparation, 11.
- aphid(s)—
 new sprays for, Ohio 362.
 rosy, control, 363.
 rosy, control, new phases, N.Y.State 785.
 woolly, notes, N.C. 500.
 woolly, root form, cyanide for control, 787.
- biennial bearing—
 control by defoliation, Mo. 47.
 prevention, Vt. 476.
- bitter pit in McIntosh variety, U.S.D.A. 343.
 bitter pit, nature and causes, Bt. 476.
 bitter rot control, N.C. 485.
 bitter rot in Missouri, control, 214.
 black root rot, distribution and severity, 214.
 black rot situation in 1941, R.I. 844.
 bland sirup production from, 441.
 biotch, eradicant sprays for, 356.
 blotch studies, Okla. 356.
 boric acid for, Mont. 628.
 branch ringing, effect on set and size of fruit, Mo. 47.

Apple(s)—Continued.

branches, pruned and unpruned, of various ages, performance, Mo. 47.
breeding, 179.
cankers, perennial, *Epicallima coloradella* inhabitant of, 369.
commercial hand pollination methods for, 633.
composition, effect of orchard fertilizers, 195.
condition, harmful effect of bruising, Pa. 628.
crab, *see* Crab apple.
crop, thinning by spraying at blooming, 50.
crown rot studies, 357.
cuttings taken in May, root-inducing substances effective on, 479.
Delicious, comparison of varieties as pollinizers, 335.
Delicious, effect of November 1940 freeze, 179.
Delicious, mealiness and quality, factors affecting, 337.
developing fruit, gross morphology and histology, 335.
diseases in Colombia, control, 491.
Duchess, coloring, effect of sodium thiocyanate, Nebr. 47.
early, red varieties, Ohio 50.
effect on urinary acidity and blood alkali reserve, 277.
emergency uses for, U.S.D.A. 723.
fertilizer experiments, N.Y.State 193.
finish and keeping quality, effect of spray materials, Mich. 766.
fire blight, extreme epidemic, 203.
fruits, gaseous emanations of one lot. effect on another 51.
fruits, histology and development, N.Y. State 193.
fruit set, effect of ringing, Ohio 331.
Golden Delicious, russetting, 195.
growth as affected by sprays, R.I. 331.
handling from tree to table, U.S.D.A. 51.
in cold storage, water loss from, cause, 337.
insects, nonsulfur sprays with special stickers v. standard materials for control, Conn.[New Haven] 499.
Jonathan, pectic changes in, as measure of ripening under differential carbon dioxide treatments, 51.
juice composition, relation to yeast multiplication, 601.
juice packed in 1940, survey, 296.
juice, preservatives, chloroacetic acids as, 10.
leafroller, new, N.Y.State 785.
leaves, internal structure and chlorophyll in, effect of sprays, Kans. 633.
leaves, photosynthesis and transpiration, effects of leafhopper feeding injury, 213.
leaves, sampling known areas for chemical analysis, 782.

Apple(s)—Continued.

maggot and mites, 230.
maggot control, Conn.[New Haven] 499, N.Y.State 785.
maggot, emergence, migration, and control, 363.
maggot sprays, making effective, 363.
maturity, days from bloom as index, 51.
McIntosh, brown core in, development in storage, 633.
McIntosh, preharvest drop, effect of boron application, 335.
McIntosh, respiration, effect of controlled-atmosphere storage, 337.
moldy core in Wisconsin, 357.
narrow-leaf variation, 480.
Northern Spy, internal break-down in storage, Mich. 633.
orchard, continuous cultivation in, harmful effects, Pa. 628.
orchard, Rome Beauty, response to tillage, 632.
orchard, Von Osten, analyses of fertilizer data from, 632.
pomace, waste, important outlet for, N.Y.State 735.
preharvest drop—
control methods, 336.
reducing with hormone sprays, R.I. 331.
sprays, effectiveness, relation to temperature, 336.
sprays for, 194, Kans. 628.
production in southern New Jersey, N.J. 766.
red color increase, effect of certain chemicals, 194.
red strains, time to pick, Ohio 331.
respiration and oxidase and catalase activity, relation to maturity and storage, 480.
response to preharvest sprays, varietal differences, 194.
rootstocks, dwarfing and seedling, tests, N.Y.State 193.
rootstocks, improved, problems of, N.Y. State 766.
rot fungus, related to human pathogen, 491.
rust diseases, epidemiology and control, N.Y.State 203.
sawfly on Vancouver Island, 500.
scab—
control, 357, Mo. 47.
control at Glasnevin, Ireland, 214.
control in Hudson Valley, N.Y.State 203.
control, lime-sulfur for, Kans. 628.
control, new spray materials for, U.S.D.A. 627.
control program, averting spray injury in, N.Y.State 203.
control, spray materials for, Vt. 485.
control, spraying for, Mo. 59.
development and comparison of fungicides for, R.I. 344.

- Apple(s)—Continued.
 scab—continued.
 epidemiology, factors affecting, 357.
 fungus, maturation and discharge of
 ascospores, Ind. 776.
 in Missouri, control, 214.
 seedlings of Rome Beauty, Gallia Beauty,
 and Golden Delicious, fruit character-
 istics, 179.
 spray, nonresidue, schedule, improvement
 in, N.Y.State 785.
 spray program for, shortened, intensive,
 N.Y.State 785.
 spray residues removal from, U.S.D.A. 50.
 spraying, Pa. 652.
 stocks, hardy, budding and grafting on,
 Ohio 50.
 storage in modified atmospheres, N.C.
 476.
 storages, refrigerated farm, Ohio 260.
 time interval between full bloom and
 fruit maturity, 334.
 tree(s)—
 borer, flatheaded, biology and con-
 trol, Okla. 228, 783.
 cultural needs, Kans. 628.
 distribution of nitrogen and car-
 bohydrates in, Mo. 335.
 fertilization, Vt. 476.
 fertilization, spring v. fall, Mo. 47.
 filler, and management, Ind. 766.
 growth and yield, effect of sulfur
 and copper sprays, 648.
 most productive age, Ohio 331.
 nitrogen requirements, U.S.D.A. 627.
 pruning, Ark. 762.
 spraying with naphthaleneacetic
 acid and derivatives, Vt. 476.
 Steele Red, growth and yield, effect
 of double-worked interstocks, 480.
 Wealthy, time of blossom induc-
 tion, 50.
 wound dressings on, U.S.D.A. 68.
 young, effects of nitrogen, Vt. 31.
 young, effects of submersion of roots
 in water, 632.
 young, induction of flower bud for-
 mation in, Mo. 47.
 young, on clonal stocks, trunk diam-
 eters, 480.
 varieties, behavior following Nov. 1940
 freeze, 50.
 varieties top-worked on Virginia Crab,
 fruiting, 480.
 variety tests, Miss. 191.
 Washington, marketing in Los Angeles,
 Wash. 268, 695.
 water core, factors involved, 337.
 winter injury, reducing, N.Y.State 193.
- Apricot(s)—
 kernels, debittering, 441.
 orchards, border trees, relative yields,
 632.
 unsulfured, drying experiments, 296.
- Arachis*, wild species, fruits of, 25.
- Aralac—
 fiber, properties, 285.
 new fiber made from cow's milk, 285.
- Archips*—
argyrospila, see Fruit tree leaf roller.
fumiferana, see Spruce budworm.
Arge macleayi on hazelnut, 664.
Argyresthia laevigatella, biology and natural
 control, 650.
Argyrotaenia citrana, see Orange tortrix.
 Arkansas Station notes, 427, 721.
 Arkansas Station report, 142, 867.
 Arkansas University notes, 427, 721.
- Army—
 food and fighting efficiency, 547.
 rations, vitamin supplementation, rela-
 tion to fatigue and ability to do mus-
 cular work, 706.
 subsistence, research in, 410.
- Armyworm(s)—
 control in wheat, timing in relation to,
 Okla. 783.
 fall, control, Ark. 72.
 in wheat, control with poisoned bait, 81.
- Arsenic, colorimetric microdetermination
 after evolution as arsine, 730.
 Arsenic, water soluble, ultimate value, 782.
 Arsenicals, effect on cotton aphid, predators,
 and other insects, 361.
 Arteriosclerosis in clinical case of John's
 disease, 243.
- Arthritis in lambs, Mont. 676.
- Ascaridia*—
dissimilis in turkeys, life history, 384.
galli eggs, studies, 815.
galli, resistance of chickens to, Kans.
 676.
- Ascaris*—
 sp., parasite of squirrel, 497.
 spp. anthelmintic efficiency of Flcin
 against, 247.
- Ascochyta pinodella* on peas, N.Y.State 66.
- Ascorbic acid—see also Vitamin C.
 blood plasma, determinations in mass
 studies in human nutrition, Pa. 715.
 concentration in blood, effect of hyper-
 pyrexia, 715.
 daily intake required to maintain ade-
 quate amount in blood plasma, 560.
 excretion at known levels of intake, rela-
 tion to capillary resistance, dietary
 estimates, and human requirements,
 562.
 improved photometric method for, 735.
 in blood of dairy cattle, variations in,
 810.
 in blood plasma and urine, determina-
 tion, 153.
 in blood plasma, rate of increase after
 ingestion of this vitamin, 561.
 in body fluids of horses, 103.
 in buffaloberry, 861.
 in expressed vegetable juice, 559.
 in fruits and vegetables, factors in pro-
 cessing affecting, 713.

Ascorbic acid—Continued.

- in grapefruit juice canned by various processing methods, 860.
- in honey of different localities, 551.
- in milk, relation to volume of milk produced, 238.
- in normal adults, urinary excretion and plasma concentration, effect of controlled ascorbic acid ingestion, 419.
- in persimmon leaves and fruits, 861.
- in plant life, physiological activity, 29.
- in prepared foods, 281.
- in rhubarb, 559.
- in rose hips and rose-hip sirups, 862.
- in small fruits, 861.
- in summer squash, loss during cooking, 862.
- in tomato catsup, 862.
- in tomato, effect of mineral nutrition, 560.
- in tomato juice, effect of processing Ark. 845.
- in whole blood, clinical estimation, 735
- physiological activity in plant life, 713
- plasma and dietary, relation, 561.
- requirement of children, 420, 862.
- requirement of premature infants, effect of diet, 560.
- storage in vitamin A deficient hens, 803.
- synthesis in excised tomato roots, 29.
- tolerance test and application to senile and schizophrenic patients, 562.

Ash trees, young white, eccentric growth in main stem, Vt. 33.

Asparagus—

- butts, utilization, 297.
- depth-of-planting studies, 332.
- production, 620.
- texture, effect of rate and extent of freezing, 432.
- variety tests, Ga.Coastal Plain 331.

Asparthione, synthesis, 582.

Aspergillus—

- clavatus*, bactericidal effects, 177.
- niger*, hydrolysis of arabogalactan by optimal conditions, 769.
- niger*, repeated recovery and re-use in gluconic acid production, 726.
- spp., production of bacteriostatic substances by, 601.
- sydowi*, unautolyzable protein of, 744.
- wentii* on cottonseed, pathogenicity, relation to moisture content, 487.

Aspidiotus perniciosus, see San Jose scale.

Assimilation concept and field research, 696.

Association of Land-Grant Colleges and Universities—

- 1942 convention, editorial, 1.
- officers elected, 4, 143.
- research at 1942 convention, editorial, 145.

Aster—

- rust control by wettable sulfur, Ohio 844.
- silver blight, of unknown cause, R.I. 344.
- yellow, insect vector, protecting plants from, 222.

Asterolecanium bambusae, control, P.R. 655.

Asterolecanium milliariae, control, P.R. 655.

Asteropaeus sp., effect of dormant sprays on, 511. •

Astragalus species, selenium indicator, identification, 31.

Astronomy, maps, and weather, treatise, 298.

Ataxia—

- a hereditary nervous disorder of rabbit, 86.
- enzootic, of lambs in South Australia, 529.
- enzootic, of unweaned lamb and copper deficiency in ewes and lambs, 389.

Atmosphere of inoculating room, rendered sterile by ultraviolet irradiation, 203.

Atricholaelaps glasgowi, parasite of squirrel, 498.

Atropellis—

- apiculata* n.sp., description, 359.
- tingens*, cause of canker of eastern pines, 780.

Attagenus piceus, see Carpet beetle, black.

Auction markets, livestock, volume of sales and movement, Ky. 539.

Autographa brassicae, see Cabbage looper.

Autolysis, oxidation, reduction, and sulphydryl in, 727.

Autopolyploidy, consequences of, in crop plants, 179.

Autotetraploidy, photoperiodism accompanying, 34.

Auxin(s)—

- action, mechanism, 602.
- extraction from corn, from corn smut tumors, and from *Ustilago zeae*, 61.
- extraction from plant tissues, 462.
- extraction from wheat, 462.
- storage, relation to endosperm type in maize, 28.
- synthetic, and derivatives, comparative activity, 742.
- transport, polar and apolar, in woody stems, 742.

Avidin—

- distribution in hen's egg, 417.
- effect on egg-white injury in rats, 283.
- stability, 711.

Avocado(s)—

- dying-back or decline, cause, Calif. 404.
- Fuerte, modified air storage, 635.
- leaf sap concentration and cold resistance in, 54.
- pollen germination, 482.
- varieties, new, 197.

Azalea—

- breaking rest period, low temperature for, Miss. 191.
- sawfly in greenhouse at Collingdale, 664.

Azotobacter—

- agilis* in North and South America, 26.
- associated with other bacteria, nitrogen fixation by, 305.
- growth and activity, effect of absolute reaction of soil solution on, Kans. 595.

***Asotobacter*—Continued.**

- plaque test for determination of phosphate deficiency in Idaho soils, 163.
- vinelandii*, distribution of isotopic nitrogen in, 726.

Babesia foliata n.sp. from sheep, 245.

Baby beef, *see* Cattle, baby beef.

***Bacillus*—**

- abortus*, *see* *Brucella abortus* and Bang's disease.
- larvae*, growth factor requirements, 228.
- subtilis* status, 457.
- thermoacidurans*, detection in tomato juice and cultivation in laboratory, 292.

Bacon research program in Canada, 130.

Bacon, smoked and unsmoked, comparison, 516.

Bacteria—

- activity in dilute nutrient solutions, 26.
- aerobic and facultative, use of proprietary peptones by, 457.
- air-borne, bactericidal action of ultraviolet radiation on, 26.
- and other organisms from water, effect on quality of dairy products, 238.
- attacking petroleum and oil fractions, 175.
- bacteria, autotrophic, biochemistry, 740.
- cytology of, 739.
- effect of gramicidin and tyrocidine on, 457.
- fluorescent, in dairy products, Mo. 92.
- growth factors for, 175.
- growth in iron-free medium, 739.
- growth under Visking sausage casing, 291.
- heat resistance, factors affecting, 457.
- heat resistance, relation of maximum growth temperature, 26.
- important for kraut fermentation, 295.
- in evaporated milk, relation to temperature of heating and sterilization, U.S.D.A. 671.
- in milk and soil, *see* Milk and Soil(s).
- intermediate colilike, differentiation, 457.
- luminous, nutritional requirements, 457.
- multiplication, in water and significance in food spoilage, 294.
- obligate cellulose-decomposing, 305.
- oxygen demand and oxygen supply, 457.
- routine tests for descriptive chart, 175.
- sexual fusion in, test for, 599.
- thermoduric, in milk, methods for detecting, 811.
- thermophilic and thermoduric, identification and control, 811.
- uptake of ions by, 309.

Bacterial—

- antibiotic substance, staining technic for evaluating toxicity, 600.
- flagella, width and origin of, 175.
- morphology, shown by electron microscope, 450.
- taxonomy, chaotic situation in, critical review, 709.

Bacteriological technic manual of methods, supplement to leaflet I, 175.

Bacteriosis, studies, 215.

Bale ties, saving and straightening, device for, Oreg. 834.

Baliosus ruber on basswood, biological notes, 367.

Bamboo—

- powder-post beetle studies, P.R. 656.
- propagation and utilization for fishing rods, P.R. 628.
- scales, control, P.R. 655.

Banana(s)—

- dietary uses in health and disease, 544.
- diseases, 494.
- leaf spot, spray program, 215.
- respiration in storage at 53° F. and ripening at controlled temperatures, 32.
- "tree," structure and growth, 170.

Bandicoots, tick paralysis in, 525.

Bang's disease—*see also* Brucellosis.

- calfhood vaccination for, 814.
- ceased reactors' response to reexposure, 678.
- control, failure of artificial sunlight for, Ohio 383.
- control, relation to calfhood vaccination, 523.
- forum on, 814.
- in cattle, Kans. 676.
- in range cattle, control, Mont. 676.
- report of committee on, 814.
- studies, Tex. 99, U.S.D.A. 676.
- testing methods, Mo. 99.
- transmission from swine to cattle, Mo. 99.
- vaccination, public health problem, 814.

Bankhead Jones Farm Tenant Act, Title III, land purchase program under, U.S.D.A. 266.

Bark beetle vectors of Dutch elm disease fungus, 782.

Bark beetles, studies, Tex. 73.

Bartley—

- as corn substitute for feed, Ark. 755.
- average acre yields and production costs, Alaska 617.
- awn inheritance in, 466.
- breeding, Alaska 617, Kans. 618, Mo. 41, Mont. 618, Nebr. 41, Tex. 42, Oreg. 619.
- cold resistance, factors affecting, Nebr. 41.
- culture tests, Kans. 618.
- development and industrial use, history, 621.
- diploid and tetraploid, induced chlorophyll mutations in, 85.
- disease, seed-borne, host-parasite relations, 486.
- fertilizer tests, Ga. 617.
- for fattening cattle, Mo. 84.
- freaks produced in breeding work, 621.
- loose smut control, Okla. 769.
- loose smut, relation to yield, 486.
- midew resistance, linkage relations of Goldfoll factor for, 747.
- milling products, vitamin E in, and effect of bleaching, 715.

Barley—Continued.

- new, Sunrise, for North Carolina, N.C. 473.
- planting tests, Nebr. 41.
- plants, absorption and accumulation of rubidium bromide by, 173.
- plants, carbohydrate changes in organs during growth, 171.
- plants, carbohydrates and inorganic constituents, effect of saline substrate on hourly levels, 172.
- scab absent in western North Dakota, U.S.D.A. 58.
- scab and blight in local areas in 1942 crop, U.S.D.A. 202.
- scab control, U.S.D.A. 349.
- scab in Virginia, U.S.D.A. 58.
- seed-borne disease, environmental relations in, 771.
- seed, inoculating with covered smut, methods, 348.
- seedlings, growth responses to K and Na. 605.
- sugar metabolism, relation to defoliation and shading of ear, 744.
- superior varieties or strains grown by station, Oreg. 619.
- testing for chinch bug resistance, Okla. 783.
- varieties, Mich. 755, Miss. 41.
- variety tests, Ark. 753, Kans. 618, Miss. 325, Mo. 41, Mont. 618, Nebr. 41, Okla. 755, Tex. 42.
- Velvon, advantages of, Utah 620.
- winter, growing in New Jersey, N.J. 43.
- winter, hardiness, yields, and disease control, effect of seed treatments, Mo. 59.
- winter, studies, W.Va. 473.

Barns—

- dairy, construction, Vt. 534.
- remodeled, as aid for wartime needs, 534.

Basswood leaf miner, biological notes, 367.**Bat, survival of spermatozoa in female reproductive tract of, 324.****Bay oil, distillation—**

- studies, P.R. 570.
- use of salt in. 442.

Bean(s)—see also Soybean(s) and Velvet-bean(s).

- aphid on orange-glowvine, P.R. 656.
- baked, dehydrated, 544.
- beetle, Mexican, control on bush lima beans, N.Y.State 79.
- breeding, use of X-rays in, N.Y.State 191.
- canning, improvement, N.Y.State 191.
- culture, in humid areas, U.S.D.A. 188.
- curly top injury, relation to time of planting, 366.
- curly top virus strains in susceptible and resistant varieties, concentrations, 349.
- dehydrator for, Colo. 849.
- effect of platinum chloride, 462.

Bean(s)—Continued.

- fertility needs and cultural practices for, Mich. 755.
- French, stem eelworm disease, first record in New South Wales, 207.
- Fusarium* yellows, 350.
- growth and mineral nutrition, effect of light quality, 464.
- halo blight, physiology and breeding for resistance, Nebr. 59.
- insects in Hawaii, 656.
- leaf development of intact and decapitated plants, effect of green v. red light on, 607.
- leaf spots, Ohio, 344.
- lima—
 - bacterial blight, N.J. 490.
 - bush, spraying and dusting experiments, N.Y.State 79.
 - chemical factors affect set of, 192.
 - Chickasaw, virus diseases, 490.
 - cultural tests, Ga.Coastal Plain, 331.
 - effect of fertilizer placement, Va. Truck 332.
 - fertilizer tests, Ga.Coastal Plain 331.
 - response to seed treatment, 48.
 - seed production, P.R. 629.
 - seed treatment, N.Y.State 203.
 - seed treatment and spraying and dusting, N.Y.State 203.
 - variety tests, Ga.Coastal Plain 331.
- manganese deficiency in, 168.
- mosaic control in Great Northern variety, Mont. 641.
- mosaic, production of seed free from, N.Y.State 203.
- navy, plat technic studies, 759.
- pods, edible, quality and time of development of fibrous sheath in sidewall, 629.
- Red Kidney, production in California, Calif. 328.
- Refugee, varieties, N.Y.State 763.
- roots, cell proliferation and protoxylem differentiation in, effect of l-proline, 463.
- seed, disease-free, production, N.Y.State 203.
- seed, response to hormone treatment, N.Y.State 190.
- seedlings, effects of radiant energy in relation to etiolation, 32.
- snap, dehydration tests, 849.
- snap, effect of fertilizer placement, Va.Truck 332.
- snap, for marketing, canning, and freezing, U.S.D.A. 191.
- snap, major diseases, breeding for resistance to, Ga. 640.
- snap, variety tests, Ga. 627, Ga.Coastal Plain 331.
- snap, vitamin C in, 627.
- varieties, Mich. 755.

Bean(s)—Continued.

variety and strain tests, Miss. 191.

virus diseases, 490.

weevil, notes, Mont. 655.

Beanstalk weevil, life history, habits, and control in New Mexico, U.S.D.A. 505.**Beauveria bassiana** distribution on elm insects in United States, 650.**Bedbug**—

as pest of poultry, U.S.D.A. 98.

fumigants, tests, 782.

Bee(s)—

activities, Tex. 73.

activity, relation to orange nectar and pollen, 83.

behavior, effects of sulfur compounds applied during bloom, 362.

bread and royal jelly, vitamins in, 82.

caged, longevity, factors affecting, 795.

feeding with soybean flour as pollen substitute, 83.

foulbrood, *see* Foulbrood.

larvae, susceptibility to individual inoculations with *Bacillus larvae* spores, 795.

management manual, 272.

median lethal dose of calcium arsenate for, 499.

nests as reservoirs and sources of stored products pests, 73.

package, *Nosema apis* in, 663.

poisoning in Washington, 81.

pollen requirements of a colony, 83.

queen, one and two-year-old, 228.

queen rearing, Tex. 73.

studies, Kans. 655.

usefulness in pollination, U.S.D.A. 228.

Beef—*see also* Cattle, beef.

aged, effect of freezing on tenderness in, 272.

dark cutters in, Kans. 666.

dehydrated, methods for production, U.S.D.A. 700.

finish and quality, effect of ratios of concentrates to lespedeza hay on, U.S.D.A. 665.

improvement, plans at station for, Utah 233.

increased production from same number of cattle, Nev. 233.

liver catalase, preparation by use of acetone or alcohol, 728.

production—

crossbreds for, 181.

effect of mineral and carotene feeding, Tex. 85.

increasing after the war, 796.

maximum, from mountainous summer range, Utah 233.

with minimum-for-efficiency investments, Miss. 537.

with minimum grain and maximum roughage, Mo. 84.

quality, effect of ultraviolet light and temperature during aging, 513.

Beef—Continued.

quality produced on cottonseed meal and hulls, U.S.D.A. 665.

quality, relation to ultraviolet light and temperature during aging, Wash. 847.

U. S. grades, relation to palatability of porterhouse steaks, Mo. 127.

Beekeeping—

industry in Montana, Mont. 655.

two-queen hive system, value, Ohio 362.

Beer, vitamin B complex in, 856.**Beet(s)**—*see also* Sugar beet(s).

application of sodium nitrate, R.I. 331.

break-down in, boron for prevention, 646.

dehydrator for, Colo. 849.

dried, made into bricks freed from air in new packaging process, N.Y.State 850.

effect of storage on betanin and sucrose in, and importance in breeding program, 629.

germination and yield, effect of carbon black, R.I. 331.

internal break-down, [N.Y.]Cornell 207.

leafhopper, importance of birds in checking, Utah 653.

molasses rations for pigs, nutritional inadequacy, Utah 516.

planting methods, 763.

scab in New York fields, U.S.D.A. 343.

seed, sheared, treatment, 487.

seed treatments, Tex. 59.

sugar, *see* Sugar beet(s).

variety tests, Ga.Coastal Plain 331.

webworm, notes, Mont. 655.

Beetles, wood-boring, of Saanich, Vancouver Island, 500.**Belladonna**, insects attacking, 781.**Bemisia marginata**, *see* Raspberry root borer.**Bentgrass(es)**—

Colonial, development, effect of soil temperature, 43.

Colonial, seasonal development of roots, R.I. 326.

for pasture, breeding, R.I. 326.

varieties and strains, fertilizer tests, R.I. 326.

varieties and strains, seed production, R.I. 326.

velvet, seed production, R.I. 328

Benzimidazole derivative, characterization of lactic acid as, 725.**Bermuda grass**—

production of roots, rhizomes, runners, and leaf shoots under different conditions, 185.

protein and mineral content, Ga. 579.

Berries, *see* Fruits, small, and Raspberry (ies), Strawberry (ies), etc.**Betaine**, structural specificity in transmethylation, 702.**Beverages**—

and food analyses, 406.

taste and flavor, factors affecting, 296.

Bibliography of—

- blood, 528.
- botany, geographic, 461.
- botany of New York State, 1751-1940, 25.
- brucellosis immunity, 525.
- cereal take-all disease, 348.
- entomology, 218.
- hemoglobin in poultry blood, 685.
- insects of Brasil, 783.
- insects of stored products, 656.
- land tenure policy, 265.
- malaria, avian, 248.
- parasitology, 528.
- plant communities of Welaka area, Florida, 461.
- poisonous plants, 526.
- potato blight, early, in Ecuador, 351.
- pyrethrum v. roaches, 221.
- rabies, 390.
- rationing, U.S.D.A. 111.
- specimens, embedding in methacrylate resins, U.S.D.A. 5.
- taxonomy and phylogeny, 461.
- wound healing, 677.
- xerothermic theory, 443.
- Bifusella* spp., new and interesting from Mt. Shasta, 601.
- Billbug on wheat, Ga. 654.
- Bindweed—**
 - control, Nebr. 42.
 - eradication, mechanical equipment for, Nebr. 105.
 - eradication with sodium chlorate, Ohio 326.
 - roots, carbohydrate reserves in, Nebr. 42
- Biology handbook**, U.S.D.A. 497.
- Biotin—**
 - coenzyme R, and vitamin H, review of literature, 863.
 - distribution in hen's egg, 417.
 - effect on reproduction in fowls, 237.
 - extraction from tissues, 9.
 - increase in germinating seeds, 313.
 - paper on, 705.
 - resynthesis from degradation product, 9
- Birch**, white, establishment on cutover pulp wood land in northwestern Maine, 638
- Birds—**
 - benefit to agriculture, Utah 653.
 - benefits from forest fungi and insects, 359.
 - corn earworm control by, 369.
 - flight and running speeds, 217.
 - game and domestic, peittacosislike infection in, 251.
 - game, artificial propagation, Mo. 72.
 - game, farm-raised, diseases, U.S.D.A. 99
 - of Americas and adjacent islands in Field Museum of Natural History. catalog, 652.
 - of Utah, food, 781.
 - serological study of relationships, 391.
- Birdsfoot trefoil** for pasture and hay, seedling practices and seeds, N.J. 187.
- Biscuits**, self-rising flour, thiamin retention in, 657.

Bitterweed—

- control, Tex. 42
- nutritive value and control, Tex. 85.
- studies, 807.
- Black scale—**
 - biological control, 229.
 - control, sulfur dust as supplement to cyanide fumigation for, 77.
 - encyrtid parasite of, 511.
 - propagation on potato sprouts, 504.
- Black walnut—**
 - kernels, color and quality, effect of delayed hulling, 637.
 - varieties, evaluating nuts of, 637.
- Black witch moth** in British Columbia, 500.
- Blackberry (les)—**
 - mosaic, mild forms, effects, 61.
 - phosphorus and calcium in, 133.
 - preservation with sulfurous acid, Ga. 700.
 - production, Mo 339.
 - stamen blight, 777, Oreg 641.
 - variety tests, Oreg 628
- Blackhead in turkeys—**
 - cereal obligation for control, Mo. 99.
 - heat therapy for, Mo. 99.
- Blackleg —**
 - in cattle, Mont. 527.
 - studies, U S D.A. 97.
- Blanket fabrics**, of wool and mohair, service study, 423.
- Blattella germanica*, see Cockroach, German.
- Blissau—**
 - leucopterus*, see Chinch bug.
 - penningtoni* n.sp., description, 366.
- Blister beetle**, striped, control, 72, 654, Ark. 72.
- Bloat—**
 - chronic, associated with a papilloma of reticulum in a cow, 243.
 - in cattle, analyses of gas and ingesta of, 681.
 - in dairy cattle, possible relation to rate of fermentation of rumen ingesta, 680.
- Blood—**
 - ascorbic acid in, clinical estimation, 735
 - donors, hemoglobin regeneration in, rate of, 411.
 - fructose determination in, skatole color reaction for, 589.
 - grouping technic, manual, 523.
 - nonprotein nitrogen constituents, effect of purified pituitary preparations, 471.
 - of cattle, ascorbic acid in, variations, 810.
 - of dairy cattle, chemical composition, 94.
 - picture in normal and milk fever cows, 91.
 - plasma, adequate vitamin C in, daily intake required for maintenance, 560.
 - plasma, ascorbic acid determination in, 153.
 - plasma ascorbic acid tests in mass studies in human nutrition, Pa. 715.
 - precursors of milk, constituents in, Mo. 92.

Blood—Continued.

- pyruvic acid in, removal in vitro, 280.
- ratio of lactic to pyruvic acid in, after exercise, significance, 280.
- regeneration—*see also* Hemoglobin.
- role of diet in, Minn. 549.
- review of recent literature, 523.

Blowfly strike of breech of Merino sheep, relation to tail length, 217.

Blue grama, effects of mowing, Kans. 618

Blueberry (ies)—

- adaptation studies, Ga. Coastal Plain 331.
- cane canker, 493.
- culture, Ga. 627.
- culture on different soils, N.Y. State 193.
- growth response under clean cultivation and mulch, 53.
- highbush, Cabot variety, growth, factors affecting, 340.
- highbush, inheritance of important characteristics, 106.
- leaf burn caused by high S fertilizer, N.C. 485.
- mite, new pest, N.C. 500.
- new pest of, N.C. 500.
- plants, effect of mulch on, 196.
- rest period requirements for, 481.
- seedlings, growth, effect of soil media, photoperiod, and nitrogenous fertilizer, 52.
- varieties, identification, selection of criterion leaves for, 52.

Bluegrass—

- effects of day length, Ohio 326.
- Kentucky, development, effect of soil temperature, 43.
- Kentucky, floret and seed types in, 145.
- leaf rust, amphispores in, 772.
- pasture, fertilized and unfertilized, nutrients from, digestibility and utilization by cows, Va. 520.
- pasture for laying hens, value, 377.
- pasture, live-weight gains by beef cattle on, factors affecting, Mo. 41.

Bluestem pastures, effects of fertilizers and burning, Kans. 618.

Boat decay, U.S.D.A. 640.

Bobwhite, *see* Quail.

Boll weevil(s)—

- control, 654.
- control, calcium arsenate application for, time and frequency, 368.
- control, calcium arsenate with and without aphicides for, 362.
- control, effect on cotton yield, 363.
- control, insecticide tests for, 501, 502.
- control, mopping, dusting, and combination treatments for, 368.
- control, spot dusting for, Ark. 783.
- effect of insecticidal drift in small plots, 361.
- hibernation, survival, and emergence in South Carolina, 368.
- or cotton, U.S.D.A. 228.
- studies, 218, Ark. 72, Tex. 73.

Bollworm—

- armyworm habit of, 783.
- control, 654.
- insecticide tests for control, 501.
- parasites, 783.
- pink, control, 654.
- pink, parasites *Chelonus* and *Microbracon*, methods of rearing, 361.
- pink, studies, Tex. 73.
- predator on, 72.
- red, studies, 226.
- studies, Ark. 72, Tex. 73.

Bonemeal, nutritive value, 231.

Bones, effect of low calcium and vitamin D-deficient diet of mature rats, 567.

Books on —

- aerobiology, 444.
- agriculture, permanent, 271.
- animal breeding and improvement, 408.
- asparagus production, 620.
- astronomy, maps, and weather, 298.
- biology, U.S.D.A. 497.
- botany, 309.
- cheese manufacture, 240.
- climatology, physical, 443.
- colloid science, advances in, 149.
- dietetics for clinician, 852.
- earth and man, human geography, 699.
- engineering, agricultural, 687.
- entomology, 218, 781.
- fabrics, 863.
- farm buildings, 393.
- food and family living, 543.
- forestry, American, 638.
- fruit production, 631.
- geography, physical elements of, 443.
- histology, comparative, 578.
- infants, feeding, 410.
- insects, relations to man, 361.
- laboratory technic, 383.
- livestock management, 372.
- livestock production, 230.
- man and earth, human geography, 699.
- meats, microbiology, 846.
- meteorology, 126.
- microbiology and man, 815.
- microbiology, industrial, 578.
- parasitology, 523.
- plant biology, 126.
- plant diseases, 202.
- polymers, high, synthetic and natural, 577.
- pork production, home, 800.
- snakes of United States and Canada, 217.
- soils, and use by men, 446.
- soils of Mexico, 159.
- tomato, 334.
- virus diseases, 485.
- weather forecasting, basic principles, 735.

Boron—

- deficiency in soil, use of alfalfa for detecting, U.S.D.A. 594.
- deficiency in swedes and mangels, R.I. 326.
- deficiency, plant symptoms of, 307.
- experiments, Miss. 159.

- Boron**—Continued.
in Hawaiian soils and crops, 24.
requirements for highest yields, Miss.
454.
- Botanical survey of upper Columbia River region**, 25.
- Botany**—
geographic, trends in development, 461.
of New York State, 1751-1940, bibliography, 25.
textbook, 309.
- Botryosphaeria tamaricis*** on tamarisk in Argentina, 359.
- Botrytis cinerea*** on cultivated plants and weeds, 775.
- Brachyphinus sulcatus***, see Vine weevil, black.
- Bradycardia** in rats with thiamin deficiency, mechanism of, 818.
- Bramble(s)**—
diseases in Idaho, Idaho 493.
electrolytic resistance as measure of hardiness in, Kans. 628.
winter injury and hardiness in, nature and causes, Ark. 46.
- Brassica**—
campestris as breeding host of green peach aphid, 490.
polyploid forms, self-incompatibility in, 317.
- Brazil nut industry**, Amazon Basin, U.S.D.A. 54.
- Bread**—see also Flour.
and dough, microscopic study, 543.
manufacture, stability of vitamin B₁ in, 857.
modern, from nutrition viewpoint, 407.
score, color and other changes in by use of riboflavin at proposed enrichment levels, 151.
southern, enriched with peanut flour, 699.
vitamin B₁ in, and stability during baking, 292.
white, enriched, value to consumer and baker, 846.
white, enrichment, reason for, 710.
white, enrichment with vitamin B complex, 555.
- Breeding**—see also Plant breeding and specific animals and plants.
program, analysis, 610.
- Brining process**, new applications of, U.S.D.A. 723.
- Broccoli**, thiamin determination in, 438.
- Brome grass**—
and alfalfa mixture, continuous v. rotation grazing with ewes and lambs, 187.
and alfalfa pastures, sheep grazing methods, Nebr. 42.
breeding, Nebr. 41, U.S.D.A. 616.
for pasture and hay, seeding practices and seeds, N.J. 187.
selection and breeding, Nebr. 41.
smooth, culture, Mo. 474.
strains, tests, Nebr. 41.
- Bronchitis, infectious**, R.I. 384.
- Broomcorn variety tests**, Tex. 42.
- Brucella***—
abortus—see also Bang's disease.
effect on bovine udder and its secretion, 818.
strain 19 in vaccine, viability, 524.
vaccine, use in fistulous conditions in horses, 246.
complement fixation reaction, 384.
group, accessory growth factor requirements, 524.
group organisms, sulfonamide action on and counteracting effect of para-aminobenzoic acid, 525.
opsonocytaphagic test, staining procedure for, 677.
spp. in patients in Mexico, diagnostic tests and classification of isolated bacteria, 384.
vaccine, strain 19, viability, 814.
- Brucellosis**—
control program in certified dairies, calf-hood vaccination in, 102.
immunity in animals and man, 524.
in swine, U.S.D.A. 98.
studies emphasizing strain variation in serologic testing, 677.
- Bruchus pisorum***, see Pea weevil.
- Brush land**, preparing for pastures, Miss. 253.
- Bryophyllum calycinum*** leaves, organic acids of, 315.
- Budmoth**—
control, 363.
control, reduced spray concentrations for, N.Y. State 786.
eye spotted, on apple, tests of modified mixtures for control, N.Y. State 785.
- Buffalo grass**—
breeding, Kans. 618, Tex. 42.
culture tests, Tex. 42.
effects of mowing, Kans. 618.
pasture, establishment, Tex. 42.
seed production and germination studies, Kans. 618, Tex. 42.
- Buffaloberry**, ascorbic acid in, 861.
- Bulle-head in British Columbia**, distribution and numerical status, 360.
- Bull diseases**, Ore. 641.
- Bull(s)**—see also Sires.
effect of chloretone feeding, 90.
improvement in breeding and fertility by ascorbic acid administration, 35.
nutrition, relation to breeding performance, 90.
offspring, differences in performance between sexes, 610.
production for artificial breeding rings and bull associations, U.S.D.A. 670.
progeny tests, measuring economy of gain in, factors in, 514.
scrotal temperature, measurements, 323.
seasonal variation in semen quality, 614.
semen examination for indication of fertility in, Mo. 84.

Bull(s)—Continued.

semen, fertility, relation to morphology, 90.

semen, pH of, 615.

spermatozoa—

cytochrome oxidase in, 728.

effect of amphyl on, 90.

nonhemlin and total iron content, 727.

respiration rate, 90.

used both artificially and naturally, breeding efficiency, 90.

Bull terriers, coat color inheritance in, 35.

Bunchgrass, carbohydrate and nitrogen trends in, 606.

Bunostomum phlebotomum, percentage incidence in cattle, 101.

Bunt, *see* Wheat smut, stinking.

Bur-clover, growing seed of, Miss. 326.

Bureau of—

Agricultural Economics report, U.S.D.A. 835.

Dairy Industry report, U.S.D.A. 670.

Entomology and Plant Quarantine, service and regulatory announcements, cumulative index, U.S.D.A. 786.

Butter—

and margarine, vitamin A value compared to vegetables, 128.

and oleomargarine, comparative nutritional value, 701.

flavor defects of, evaluation, 96.

from cream having mold mycelia growth in, treatments affecting, 91.

from cream with naturally active lipase, keeping quality, effect of pasteurization temperatures, 812.

industry of tomorrow, 520.

inhibition of mold growth on surface, treatment of parchment wrappers for, 808.

keeping quality, methods for determining, 808.

mold in, 807, 808. Okla. 808.

mold mycelia count, factors affecting, 520.

odor produced by *Pseudomonas putrefaciens* in, 239.

quality, effect of free fatty acids in cream, 808.

quality, estimating, 7.

quality in, counts of mold mycelia for, Ark. 797.

quality, method for estimating, 92.

quality, relation to bacteria from water sources, 239.

quality, relation to manufacture and other conditions, Tex. 92.

rheology, 382.

scoring, comparative standardization, 814.

surface taint, studies, 239.

unsalted, from sweet cream, keeping quality, 91.

Butterfat—

free fatty acids determination in, 7.

prices in Kansas, factors affecting, Kans. 696.

production, effect of continuous injection of pitocin, 91.

production, effect of feeding shark-liver oil, 800.

production in dairy cattle, heritability, 810.

Buttermilk, churned cultured, merits, 240.

Button spider, insect food and hymenopterous parasites of, 512.

Byturus, *see* Raspberry fruitworm.

Cabbage—

Alternaria leaf spot varietal reactions, Tex. 60.

black rot, seed treatment for, Tex. 60.

caterpillars, insecticidal tests against, La. 362.

cultural tests, Ga.Coastal Plain 331.

damping-off control, Tex. 60.

dehydration tests, 849.

downy mildew and wire stem control, Miss. 203.

dried, made into bricks freed from air in new packaging process, N.Y.State 850.

fertilizer tests, Ga.Coastal Plain 331.

insect control, rotenone-bearing dusts for, N.Y.State 785.

looper studies, Tex. 73.

maggot control, N.C. 510.

maggot control, substitutes for mercury salts in, N.Y.State 785.

maggot on turnips, Mont. 655.

Penn State Ballhead, problems in its development, Pa. 332.

Penn State Ballhead, tests, Pa. 628.

production and marketing in New York, [N.Y.]Cornell 399.

seed treatment and seedbed fumigation, Miss. 354.

seedlings, oospore production by *Peronospora parasitica* in, 484.

starter solution experiments, 476.

variety tests, Miss. 331.

vitamin C in, 627.

webworm studies, Tex. 73.

yellows-resistant varieties, N.Y.State 203.

Cabbageworm(s)—

control, diluents and supplements for lead arsenate dusts for, N.Y.State 785.

effect of lime on toxicity of lead arsenate to, 368.

byproducts in pig feeding, 376.

Cacao witches'-broom disease studies, 494, 778.

Cactus—

biological destruction on range land, 506.

growth on Great Plains, effect of insects and weather, 298.

pricklypear, problem in Colorado and Wyoming, ecological aspects, 626.

pricklypear, seed, dissemination by jack rabbits, 762.

Cactus—Continued.

pricklypear, survey, Kans. 618.

pricklypear, thrips, 72.

Cadelle on milled rice, U.S.D.A. 73.

Ooduroia plutellae n.sp., description, 661.

Cake making, sugar substitutions for, Mont. 545.

Calcium—

and magnesium, supplying, by limestone and dolomite, divergence in behavior, 185.

in expressed vegetable juice, 559.

metabolism, vitamin D, and parathyroid glands, 91.

microdetermination by precipitation, 586.

quick-test technics for, 149.

retention, effect of lemon juice on, 277.

retentions, variability in, length of observation period as factor, 853.

salts of phytic acid, composition and solubility, 289.

Calendra venata on wheat, Ga. 654.

Calf(ves)—

additions of fish meal and alfalfa hay to rations, Nebr. 84.

beef, creep feeding, N.C. 514.

beef, production, Miss. 798.

beef, rations for, Ark. 83.

blood plasma, vitamin A and carotene in, 90.

carcasses, market classes and grades, U.S.D.A. 260.

creep feeding, Ga.Coastal Plain 372, Okla. 374.

creep feeding on reed pasture, U.S.D.A. 665.

dairy, dry meal v. skim milk powder for, Mont. 671.

diarrhea, 523.

fattening, Kans. 666.

fattening, cottonseed cake v. corn in ration, Miss. 86.

fattening rations compared, Mich. 233.

fattening, supplements to corn and silage for, Nebr. 84.

feeder, use of silage for, Ark. 797.

goiter in, prevention with iodized salt, Mont. 676.

growth, digestible nutrient requirements, Vt. 520.

mammary gland development, relation to later milk production, U.S.D.A. 670.

milk substitute v. skim milk for, Tex. 92.

nutrition, carotene in, 95.

nutrition, review, 95.

on pasture, creep feeding, Ga. 666.

on rations low in potassium, lesions of Purkinje fibers of heart resulting from, 243.

passage of liquids into rumen, factors affecting, 94.

persistent foramen ovale and multiple defects of interventricular septum, 527.

raising on Coyner nipple pail, Kans. 671.

raising on minimum of milk, Alaska 666.

Calf(ves)—Continued.

raising, war emergency plans for, 811, Ohio 380.

scours, nutritional studies on, 90.

thyroidectomized, growth and metabolism, Mo. 92.

wealer, production, Kans. 671.

wartime rations for, 521.

wintering and fattening, soybean meal for, Nebr. 84.

California—

prionus, life history and control, N.Mex. 78.

Station notes, 427.

University notes, 427.

Camassia, gametophyte development and fertilization in, 465.

Canalgre tests for tannin, Tex. 25.

Candida krusei, effect on heat resistance of lactic acid bacteria, 96.

Candy making, fruit as sugar savers in, 10.

Cankerworms, studies, Kans. 655.

Cannerries, fruit and vegetable, economic study, S.C. 404.

Canning—

methods, home, Calif. 409.

v. freezing, 295.

with pressure cooker, W.Va. 129.

Cantaloup, see Muskmelon(s).

Capillaria—

caudinflata of chicken and turkey, earthworms as possible hosts, 384.

longipes, percentage incidence in cattle, 101.

Capillary resistance, abnormal, in swine suffering from an inherited bleeding disease, 684.

Capons, feed utilization by, breed variations in, Okla. 797.

Caragana arborecens, formation of adventitious roots, 457.

Carbohydrate—

characterization, 725.

of complete diet, digestion and absorption, effect of vitamins and yeast, 135.

Carbon—

dioxide, fixation by pigeon liver in dissimilation of pyruvic acid, 583.

in soils, determination, accurate wet combustion method, 728.

Carnation(s)—

bacterial wilt in Indiana, U.S.D.A. 203.

breeding, N.C. 476.

field-grown, *Platynota stultana* as pest, 79.

greenhouse, tartar emetic for thrips control on, Wash. 503.

sleepiness in, 55.

Carob, aerial root system of, significance, 316.

Carotene—

absorption and retention by hens on normal and low fat rations, 803.

absorption, metabolism, and storage, 413. analysis, relation to isomerization of β -carotene, 484.

β - and neo- β -, determination with visual spectrophotometer, 484.

Carotene—Continued.

- and vitamin A, utilization in rat, 551.
- balance experiments with cows and bullocks, 374.
- chromatographic determination, activation of dicalcium phosphate for, 436.
- destroying power of animal protein feed, Tex. 85.
- in expressed vegetable juice, 559.
- in Michigan-grown hay for dairy cattle, Mich. 238.
- in peaches, Ark. 845.
- in plant material used for hay, stability, 374.
- in plants, determination, 152.
- β -, in prepared foods, 281.
- in range grasses and content of some feeding stuffs of South Africa, 232.
- in Texas range forages, 798.
- leaf, determination method, 8.
- new source of, 855.
- (provitamin A), requirements of dairy cattle for conception, 90.
- relation to animal nutrition, 232.
- requirement of calves, 95.
- requirements of cattle, sheep, and swine, 798.
- stability and tocopherol, 855.
- utilization by beef animals, relation to protein supplements, Tex. 85.

Carotenoid(s)—

- and vitamin A, determination in feces, 153.
- biologically active, and vitamin A, 413.
- in prepared foods, 281.
- of telial galls of *Gymnosporangium juniperi-virginianae*, 216.
- pigments from mineral oil, separation and characterization, 26.
- pigments of cryptogams, 310.
- pigments, pure, preparation and absorption spectra, 292.
- provitamin A, assays of, 9.
- studies, 434, 435, 436.

Carpet beetle—

- black, natural habitat for, 72.
- Laelius* sp., parasite of, 500.

Carpet grass—

- effect of lime and fertilizer mixtures, 759.
- pastures, improvement by disking and legumes, N.C. 473.

Carpocapsa pomonella*, see Codling moth.**Carpophilus dimidiatus*, see Corn sap beetle.****Carrot(s)—**

- Alternaria* leaf blight, Tex. 60.
- branched roots of, factors affecting, 629.
- breeding and improvement, Nebr. 47.
- Cercospora* blight of, 775.
- Chantenay, quality in, relation to seed production, 48.
- dehydrated and fresh, vitamin A value, 281.
- dehydration tests, 849.
- dehydrator for, Colo. 849.
- diseases, Ohio 344.
- dried, made into bricks freed from air in new packaging process, N.Y.State 850.

Carrot(s)—Continued.

- ensiling for milk production, Ohio 380.
- fertilizer tests, R.I. 326.
- rust fly, biology, 370.
- rust fly, fluctuations in population, 370.
- seedstalk development, effect of infecting with certain viruses, 211.
- seedstalk development, effect of temperature and photoperiod, 630.
- variety tests, Ga.Coastal Plain 331.

Cassava diseases and control in Brazil, 642.**Castor-bean(s)—**

- culture tests, Tex. 42.
- production tests, Kans. 618.
- sheller, 259.
- thresher, construction, Ky. 833.
- variety tests, Ga. 617, Nebr. 41, Tex. 42.

Castor oil to replace tung oil, use, U.S.D.A. 627.**Catalase, preparation and properties from different sources, 728.****Catalpa—**

- damage due to recreational use, 496.
- sphinx, cankers associated with, 496.

Cataract—

- formation in rats, relation to riboflavin, 417.
- in rats, Mo. 135.

Catarrh, infectious, of chickens, transmission to mice and rats, 391.***Catenotaenia* sp., parasite of squirrel, 497.****Caterpillar—**

- red-headed, on peanut and partridge pea, Ga. 654.
- red-humped, notes, Mont. 655.

Cations, surface active, antibacterial action of, 457.**Cats, diseases and parasites, U.S.D.A. 98.****Cattle—see also Calf(ves), Cow(s), Heifer(s), Livestock, and Steers.**

- apparently normal, occurrence of *Bar-tonella* in, 384.
- Ayrshire, growth studies, body weights and heights at shoulders, 808.
- baby beef, fattening, rations for, Oreg. 666.
- beef—

- Alyc-clover v. Kobe lespedeza as maintenance feed for, Miss. 325.
- and dual-purpose, muscle-bone ratio as index of merit, 513.

- breeding and feeding tests, Mont. 663.

- enterprise, farmer experience with, La. 397.

- fattening, blackstrap molasses for, Tex. 85.

- fattening, comparison of rations for, Ga. 666.

- fattening, linseed meal v. cottonseed meal for, Tex. 85.

- fattening rations, Tex. 85.

- fattening rations, dried citrus pulp in Tex. 86.

- fattening, vitamin A requirements, Tex. 85.

Cattle—Continued.**beef—continued.**

- feeding and performance tests, Mont. 666.
- for breeding purposes, U.S.D.A. 374.
- forest grazing with, 797, N.C. 514.
- grazing and dry-lot feeding on various grasses, U.S.D.A. 665.
- management and production methods, Mo. 84.
- production and forest grazing, Ga.Coastal Plain 232.
- rations for, Nebr. 84.
- vitamin A requirements, Tex. 85.
- wintering, Ga. 666.
- wintering, roughages for, Fla. 232.
- blood, chemical composition, 94.
- breeding, management, and judging, 230.
- daily weights, nonrandomness of variations in, 515.
- dairy—*see also* cow(s).
 - and milk products, studies, Ohio 380.
 - balancing rations for, 808.
 - butterfat production in, heritability, 810.
 - conception in, vitamin A requirements, Tex. 92.
 - culling and progeny testing, value of short-time records for, 610.
 - effect of inbreeding on birth weight, growth rate, and type, 181.
 - feeding, new developments in, 520.
 - feeding value of sweetpotato meal and peanuts on vine, Ga. 671.
 - grazing habits, 671.
 - importance of adequate feeding, Miss. 92.
 - judging, U.S.D.A. 238.
 - lactating, basal energy metabolism, Mo. 92.
 - legume v. nonlegume dry roughage for, Tex. 92.
 - nutrition, vitamin C in, 90.
 - pastures and feeding for, Ga.Coastal Plain, 380.
 - prairie hay for, Okla. 808.
 - reaction time to electric shock, effect of age and weight, 520.
 - respiratory quotient in, effect of fasting and refeeding, Mo. 92.
 - resting maintenance cost in, 90.
 - selection for conformation in, 94.
 - simple v. complex rations for, 90.
 - vitamin A requirements, 807.
- diseases—*see also specific diseases.*
 - and parasites, U.S.D.A. 97.
 - common, 243.
 - special report, U.S.D.A. 243.
- dual-purpose, breeding studies, U.S.D.A. 800.
- effects of copper intake on, 527.
- fattening—
 - barley for, Mo. 84.
 - cracked Early Kalo and cracked corn for, Nebr. 84.

Cattle—Con**fattening—continued.**

- mineral requirements, Kans. 666.
- rations, sorghum roughages and grains in, Kans. 666.
- soybean meal v. cottonseed meal for, Nebr. 84.
- vitamin A deficiencies in, U.S.D.A. 665.
- feces, androgenic substance in, 753.
- feed production, rotation pastures v. cultivated crops, Mo. 41.
- feeder, diseases, Kans. 676, 678.
- feeder, purchasing, Mich. 233.
- for Tropics, U.S.D.A. 515.
- gastrointestinal nematodes, in southeastern United States, 100.
- gastrointestinal parasites in, Tex. 99.
- giving low titer reactions to Bang agglutination test, Mo. 99.
- grazing and dry roughages for, Okla. 797.
- grazing logged-off land with, Oreg. 666.
- grazing on improved v. unimproved pastures, Ga. 666.
- grazing on *Phalaris tuberosa*, staggers syndrome in, 528.
- grazing preferences, Nebr. 42.
- growth, limiting factors for in grain and timothy hay, U.S.D.A. 670.
- growth rate and efficiency of weight increment, effect of thyroxine, 91.
- grubs, control, Miss. 499, U.S.D.A. 98.
- grubs, control in range cattle, 781.
- heat disposal and tolerance in, U.S.D.A. 665.
- herds, Holstein and Jersey, line-breeding, Mo. 34.
- herds, institutional, inheritance of milk-producing capacity in, Pa. 671.
- herds of the station, N.Dak. 373.
- Holstein, body weight, relation to resting energy metabolism and ventilation rate, Mo. 320.
- Holstein-Friesian and Jersey, development of improved strains, U.S.D.A. 670.
- hornfly control, new larvicide for, 227.
- hybrid beef, paper on, 797.
- hybrid beef, production, breeding methods, 610.
- hydrocephalus, a lethal in, 468.
- in semiarid regions of Union of South Africa, bionomic studies, 323.
- injuries caused by ingesting foreign objects, U.S.D.A. 98.
- internal parasites, 523.
- Jersey, development of high producing strain, Mo. 34.
- lice, U.S.D.A. 98.
- livers, hard yellow, Tex. 99.
- lungworm, life history, 680.
- lungworm, survival of preparasitic stages on pastures, 384.
- mineral deficiencies in, U.S.D.A. 665.

Cattle—Continued.

new disease characterized by nervous disorder, Tex. 99.

nutrition, new developments in, 514.

on bitterweed ranges, maintenance, Tex. 85.

on phosphorus-deficient range, effect of supplying phosphorus on beef production, 513.

parasites and treatment for removal, U.S.D.A. 676.

pasturing and feeding tests, U.S.D.A. 670.

plague, *see* Rinderpest.

poisoning, *see* Plant(s), poisonous, and specific plants.

Polled Hereford, establishment of superior strains, Ga.Coastal Plain 373.

population, purebred Aberdeen Angus in United States, 1900 to 1939, breeding structure, 610.

prenatal development, Minn. 181.

producing farms in Coastal Plain, survey, N.C. 115.

range beef, fertility in, 610.

range, Squaw Butte, proximity of water on, Oreg. 666.

rumen gases and bloat in, Oreg. 676.

scab and control, U.S.D.A. 98.

sex ratio in, 472.

temporary winter pastures for, Ga. 666.

thyroidectomized, age changes in, Mo. 320.

thyroidectomized, growth and energy metabolism, 91.

ticks, *see* Tick(s).

toxicity of tung tree foliage to, Fla. 526.

vitamin A and carotene requirements, 798.

wheat as feed for, Utah 667.

wintering rations for, Nebr. 521.

Cauliflower—

black rot resistance, breeding for, N.Y.State 203.

growth and yield, effects of partial defoliation at transplanting time, U.S.D.A. 47.

thiamin determination in, 438.

Cecitis in rats—

prevention by succinyl sulfathiazole, 816.

prophylactic effect of sulfaguanidine against, 816.

Cedar—

eastern red, *Phomopsis* blight, Nebr. 59.

rust, *see* Apple rust.

seedling blight in Puerto Rico, U.S.D.A. 71.

western red, heartwood decay, variability in resistance to, 70.

Celery—

blight, western, virus-induced, 343.

calico on delphiniums and other host plants, Calif. 69.

early blight, Ohio 344.

Celery—Continued.

growth and yield, effects of partial defoliation at transplanting time, U.S.D.A. 47.

"hollow stalk" in, causes, R.I. 831.

seedlings on Everglades muck, effect of starter solutions, 191.

Cell division, effects of colchicine, 746.

Cellulose—

deterioration by fungi, determining, 716.

fibers, structure of, review, 571.

Celtuce—

disease symptoms caused by bean leafhopper, 646.

downy mildew, U.S.D.A. 58.

Septoria leaf spot, U.S.D.A. 640.

Cephus cinctus, *see* Sawfly, wheat stem.

Ceratitis capitata, *see* Fruitfly, Mediterranean.

Ceratonia catalpae, *see* Catalpa sphinx.

Ceratostomella—

additional species in United States, 601.

and related fungi, vitamin deficiencies, 742.

ulmi, isolation from insects attracted to felled elm trees, 781.

ulmi, specificity of pyridoxin for, 70.

Cercopidae in North America north of Mexico, host plant records, 222.

Cercospora—

blight of carrot, 775.

diazii, notes, U.S.D.A. 58.

leaf blight of sugar beets, control, Ohio 344.

leaf spot on peanut, Tex. 59.

oryzae in rice, physiologic races, inheritance and linkage of factors for resistance to, 608.

oryzae, physiologic specialization in, 642.

spp., new leaf-infecting, of Oklahoma, 485.

Cercospora herpotrichoides, cause of wheat eyespot in Great Britain, 772.

Cereal(s)—*see also* Grain(s) and specific grains.

and cereal products, nicotinic acid in, assay, 732.

and seed products, U.S.D.A. 723.

as food, 407.

cellulose, roughage material for experimental animals, 407.

diseases in 1942, U.S.D.A. 58.

diseases, studies, Kans. 640.

products, nicotinic acid in, 556.

products, nicotinic acid in, determination, nature of interfering chromogens, 437.

seed germination and seed-borne disease in, nonsterile soil as medium for tests, 771.

seed treatment, *see* Seed treatment.

smuts, Oreg. 641.

take-all disease, 348.

Cereals—Continued.

waxy starches (replacing tapioca) from, U.S.D.A. 617.

Cerebrospinal fluid pressure in cattle, method for determination, 680.

Chaetomium globosum—

growth, new culture medium for, 286.
on cotton fiber and yarn, oxygen absorption and catalase production during growth, 424.

Chafer, European, importance and control, N.Y.State 785.

Chalcodermus aeneus, see Cowpea curculio.

Chaoborus astictopus, see Gnat, Clear Lake.

Chaparral, fire control in California, measuring efficiency, 202.

Cheese—

action of enzyme preparation from chicken stomach on, 92.

Cheddar—

American, in valve-vented cans, manufacture, curing, and merchandising, 520.

American, new method for manufacturing, 807.

and Limburger, gases evolved by, 92.
curing, 807.

lipase activity in, effect of copper, 813.

prepared with starter v. pure cultures, 92.

short-cure, quality relation to temperature exposures, Tex. 92.

types of bacteria developing in and cause of low-grade cheese, U.S.D.A. 671.

year-old vacuum-canned, conditions necessary for maintaining quality, 240.

cottage, making from reconstituted skim milk powder, 807.

cottage, quick freezing and storage, 807.

curd, pitching consistency, simplification of Scott Blair-Coppen test for, 382.

curing period, reducing length of by new starter, Pa. 671.

factory and storage room, use of ultra-violet rays in, 96.

flavor defects of, evaluation, 96.

grading clinics, value for educational purposes, 813.

making, 813.

making problems in South, 807.

pasteurized milk, canning, 92.

quality, relation to bacteria from water sources, 239.

relation of bitterness to flavor in, Miss. 238.

ripening in cans, N.Y.State 521.

Romano-type, use of rennet paste in, 92.

scoring, comparative standardization, 814.

solvent, orthophosphoric acid as, 674.

Swiss, starter activity, effect of heat treatment and source of milk, 813.

Swiss, textbook, 240.

Cheese—Continued.

Swiss, types of bacteria developing in and cause of low-grade cheese, U.S.D.A. 671.

Cheilonureinus microphagus, effect of dormant sprays on, 511.

Cheilosia, response to vitamin therapy, 554.

Cheilonus, methods of rearing, 361, 654.

Chemicals, water-soluble, fungicidal v. fungistatic effect on fungus spores, 770.

Chenopodium quinoa anatomy and chemical composition, 315.

Cherry (ies)—

boric acid for, Mont. 628.

carbon dioxide treatment for shipment, U.S.D.A. 627.

dehydrator for, Colo. 849.

edible, overgrowth produced by, on Sargent cherry, 481.

fruitfly control, Oreg. 655.

leaf miner, notes, N.Y.State 785.

leaf spot—

and brown rot control, Oreg. 641.

control by fixed coppers and bordeaux, Ohio 344.

epidemiology and control, N.Y.State 203.

fungus causing fruit spotting, U.S.D.A. 202.

maraschino, preparation, N.Y.State 272.

Montmorency, cultural tests, N.Y.State 193.

orchard, limiting period of clean cultivation in, Mont. 628.

physiological (?) bud blight, Oreg. 641.

preparing for frozen food lockers, 700.

rootstocks, comparison, Utah 634.

sour, yellow leaf disease, 68, 215.

time interval between full bloom and fruit maturity, 334.

tissue, stability of erythrosine dye in, Oreg. 579.

trees, leguminous cover crops for, value, Mont. 628.

Chestnut—

blight in California, 650.

blight-resistant, timber type, breeding for, 610.

blight-resistant varieties, breeding for, U.S.D.A. 627.

blight, studies, 343.

ink disease, 216.

Chick(s)—

action of diethylstilboestrol in, 322.

assays, basal rations for, 378.

backyard hatching and brooding, N.J. 88.

brooders, homemade electric, Okla. 797.

brooders, insulated electric, adaptation in uninsulated poultry houses, Nebr. 105.

brooding, use of electricity in, Mo. 105.

calibration of development under improved conditions of incubation, 88.

cow manure as source of vitamins for, 377.

creatine formation in, 237.

Chick(s)—Continued.

- day-old, shank color, effect of diet of hen, 517.
 - diseases, combating, 685.
 - dusting with hypochlorite powders, possible irritating effects, 104.
 - effect of starting rations on growth, 376.
 - embryo, early, restitution of tail in, 750.
 - embryo, experimental infection with pseudorabies virus, 387.
 - embryos, chorioallantoic membrane and response to inoculation with mycobacteria, 676.
 - feather growth, dietary factors in, 517.
 - feeding experiments with solvent-extracted tung oil meal, 236.
 - feeding experiments with willow oak acorns, 803.
 - from heterozygous parents, chondrodystrophic progeny, 468.
 - growth, effect of cow manure in diet, 518.
 - growth factors for, 379.
 - hereditary abnormalities in, developmental mechanics, 469.
 - lysine requirement, 669.
 - new growth factors for, evidence of, 518.
 - nutrition, *Lactobacillus casei* + factor in, 669.
 - nutrition, nicotinic acid in, 669.
 - nutrition, significance of biotin in, 376.
 - protein requirements, Tex. 85.
 - rations, maximum crude fiber content, Tex. 85.
 - sexing, at hatching, Kans. 325.
 - shank pigmentation, 377.
 - shipping boxes, disinfection with sodium silicate solutions, 826.
 - slipped tendon in, *see* Perosis.
 - soybean protein as source of amino acids for, 801.
 - supplemental value of grain products, Nebr. 84.
 - utilization of feeds by, Nebr. 84.
 - vitamin D requirement and dietary calcium and phosphorus levels, 804.
 - vitamin E deficient, edema in, 804.
 - well-being, effect of color of light on, U.S.D.A. 665.
 - White Leghorn and crossbred, comparative vitamin D requirements, 518.
- Chicken(s)—*see also* Chick(s), Fowl(s)
Hens, Poultry, *etc.*
- breeding for meat production, Calif. 750.
 - broiler production—
 - feed mixtures for, Miss. 801.
 - prospects and feeds for, Ark. 797.
 - studies, Kans. 686, Miss. 670.
 - crossbred broilers and layers v. purebreds, 876.
 - marketing and pricing in Kentucky, Ky. 841.
 - meat and eggs for export, U.S.D.A. 728.
 - physical and chemical composition, 700.
 - tapeworm studies, Kans. 676.

Chicory group, rubber from, N.Dak. 624.

Chigger—

- in lawns, azobenzene for control, 781.
- tropical, in California, 665.

Children—

- anthropometric and orthopedic examinations, technic for, 131.
- ascorbic acid requirements, 420.
- in college community, nutritional status, 131.
- iron requirement, 411.
- nutrition and chemical growth, evaluation, 851.
- nutritional requirements, 547.
- older school, importance of good nutrition for, Miss. 275.
- preschool, metabolism of, interrelation of calcium, phosphorus, and nitrogen in, 550.
- school—
 - ascorbic acid requirements, 862.
 - better food for, 851.
 - diets of, seasonal survey, Va. 276.
 - physical examination records, relation to scholarship and deportment, Miss. 142.
 - thiamin excretions, 710.

Chilocorus cacti, control of scale insects by, P.R. 655.

Chinch bug—

- damage to sorghum, relation to phosphorus, Okla. 783.
- in sweet corn, Kans. 655.
- new, from Argentina, 366.
- on wheat, Kans. 655.
- studies, Nebr. 73.

Chinchillas, cross-breeding of, 750.

Chironomus utahensis, biology, 500.*Chlamydomonas* susceptibility to colchicine, 463.*Chlorella vulgaris*, photosynthesis and respiration in, effect of culture filtrates, 457.

Chloreton feeding to bulls, results, 90.

Chloroacetonitrile, toxicity against confused flour beetle, 505.

Chlorochroa—

- ugata* studies, Tex. 78.
- on cotton, control by dusts, 504.
- sayi*, *see* Stinkbug, Say.

Chlorophyll(s)—

- a and b, analysis of plant extracts for, 731.
- concentration, new method for determining, 150.

Chloropicrin—

- as disinfectant for plant beds, 345.
- as factor in mobilization of soil nutrients, 738.
- for control of fungi in mushroom soil, 355.

Chlorosis—

- in citrus, Tex. 60.
- in cowpeas, relation to sulfur, Tex. 60.
- in strawberry, Tex. 60.
- of macadamia seedlings, relation to chemical constituents of seeds, 636.
- of peach leaves, cause, 631.

Chocolate—

- coating conservation, 241.
- effect on inhibiting growth of staphylococci, 408.
- ice cream coatings, substitutes for coconut oil in, 675.
- milk, bacteriological study, 675.
- milk in dairy industry, 520.

Choline—

- deficiency in rats of various ages, 554.
- determination, modified methods for, 433, 434.
- dietary, effect on liver lipids of rats, 703.
- in milk, determination, 7.
- lipotropic action, relation of B vitamins and dietary fat to, 555.
- metabolism, 279.
- nutritional importance, 133.
- paper on, 705.
- significance as dietary factor, 133.
- structural specificity in transmethylation, 702.

Chondrodystrophy, hereditary, in fowl, 468.

Choriomeningitis, lymphocytic, transmission by arthropods, 384.

Chorisagrotis auxiliaris, see Cutworm, army.

Christmas trees as farm crop, Mo. 47.

Chromosome(s)—

- degeneration, relation to growth and hybrid vigor, 467.
- handling, 607.
- in foxes, 319.
- variations, centrifugation as cause, 180.

Chrysanthemum—

- diseases, control by propagating practices, N.J. 358.
- Septoria* leaf blight, insoluble coppers for, Ohio 344.
- Verticillium* wilt, control, Ohio 344.

Chrysobothrini, North American species, revision, U.S.D.A. 228.

Chrysobothris—

- femorata*, see Apple tree borer, flat-headed.
- species, revision, U.S.D.A. 228.

Chrysomphalus anidum, see Red scale, Florida.

Chufas, hogging off, Ga. Coastal Plain 373.

Church, community, as sociological form in New York, 845.

Chytrid genera, new, 486.

Cider—

- preserved by new method, Ohio 296.
- sparkling, bulk fermentation process for, 442.

Cider-apple jelly, preparation, 11.

Cigarette smoking, immediate effect on basal metabolic rates, 570.

Cimea lectularius, see Bedbug.

Cinchona—

- culture, P.R. 628.
- drug plant chemistry of, P.R. 579.
- production, and diseases as limiting factors, P.R. 649.

Cinnamon, Ceylon and Malaya, culture, P.R. 628.

Cirphis unipuncta, see Armyworm.

Citric acid—

- effect on growth and calcium assimilation, 703.
- in pure solutions and in milk, determination, 731.

Citricola scale and parasites, biological notes, 790.

Citrus—

- and peach, comparative transpiration rates, 338.
- areas in Florida, production credit, Fla. 119.
- brown rot gummosis, 494.
- bud variants in, diploid-tetraploid periclinal chimeras as, 748.
- decline in New South Wales, cause, 648.
- dry root rot disease, control, 215.
- feeds, digestibility, 234.

fruit(s)—see also specific kinds.

Florida, juice color and quality of varieties, 197.

Florida, magnesium deficiency in, early diagnosis, 197.

juices, ascorbic acid and sulfur dioxide determination in, 294.

pulp, ensilage of, 232.

thiamin and riboflavin in, 856.

groves, plant bugs in, control, 503.

insects incidence, Tex. 73.

intakes, liberal, studies, 703.

juice, mineral composition, effect of soil treatment, 197.

leafhoppers, lime-zinc spray as repellent for, 75.

leaves, kerosene oil deposit on, determination, 74.

magnesium deficiency, early diagnosis, 494.

orchard, nocturnal wind-velocity, eddy-stability, and eddy-diffusivity in, 593.

orchards, control of brown snail in, 72.

pectin, recovery, effect of ethylene treatment, 297.

Phytophthora root rot in New South Wales, 494.

pruning-wound protectants, Tex. 60.

pulp, dried, for fattening beef cattle, Tex. 86.

pythiaceae fungi on, Calif. 495.

red mite—

effect of leaf age and feeding injury, 512.

effect of sulfur dust, 77.

population increase, effect of inert deposits of sprays, 83.

rust mites, population studies, Tex. 73.

stem-end rot, Tex. 60.

thrips, biology, 72.

thrips rearing in laboratory, 74.

thrips resistance to tartar emetic, 499.

trees, coastal, manganese and zinc deficiencies in, 215.

Citrus—Continued.

- trees, effects of applications of tartar emetic on, 795.
- varieties for rootstock purposes, seed production and seedling yields, 635.
- variety tests, Ga.Coastal Plain, 331.
- waste liquors, alcohol from, U.S.D.A. 723.

Cladis nitidula, control of scale insects by, P.R. 655.

Cladosporium—

- fulvum*, new tomato variety developed for resistance to, Mass. 49.
- sp., new form causing tomato leaf blight, Ohio, 344.

Clam(s)—

- analyses, Me. 545.
- razor, qualities, effect of canning, freezing, and storage, Oreg. 579.

Clavacin, an antibacterial substance, production, 26.

Claviceps yanagawaensis in imported seed of Japanese lawngrass, 62.

Clay(s)—

- colloidal, composition, 301.
- loam, Dunkirk silty, structure, relation to pF moisture measurements, 161.
- montmorillonite in, semiquantitative estimation, 7.
- particles, study with electron microscope, 301.
- soils, stability, 160.

Clear Lake gnat, flight and oviposition habits, 81.

Clemson College notes, 869.

Click beetles, biology, 654.

Climate(s)—*see also* Meteorology.

- and injurious insect studies, Kans. 655.
- of California, types, 14.
- of southwest Guatemala, 159.

Climatological data, 14, 299, 593.

Climatological data, 1911–1940, for Wind River Weather Station, Wash., U.S.D.A. 594.

Climatology—

- in service of agriculture, U.S.D.A. 298.
- physical, treatise, 443.

Clostridium—

- acetobutylicum*, fermentation of Jerusalem-artichokes by, 431.
- butylicum*, cell-free preparations, dissimulation of pyruvic acid by, 309.
- residue, pig feeding experiment with, 376.
- sordellii*, recovery from cattle and sheep, 679.
- sp., fermentative decomposition of purines by, 583.

Cloth strength testing, 422.

Clothes moth, webbing, in insect nests, 73.

Clothing—

- and fabrics, conservation, U.S.D.A. 716.
- for women, U.S.D.A. 716.
- for women and children, performance during wear, R.I. 425.
- make-overs from men's suits, U.S.D.A. 718.

Clothing—Continued.

- planning for farm family, Miss. 718.
- standards, British, as result of rationing program, 425.
- supplies, minimum, Miss. 424.
- supplies of socially participating white farm families, Miss. 424.

Clover—

alsike—

- nectar, relation to relative humidity, 72.
- nutrients in, effect of soil fertility, Ind. 737.

cluster, apparent digestibility of, 797.

crimson, growing seed of, Miss. 326.

crimson, response to boron with and without lime, 598.

fertilizer tests, R.I. 326.

for pasture and hay, seeding practices and seeds, N.J. 187.

inoculation, mixing artificial cultures with cottonseed meal or sand for, U.S.D.A. 617.

Ladino, promising legume in coastal plain pastures, N.C. 473.

Ladino, use as orchard cover crop, Pa. 628.

red—

breeding, Pa. 619, U.S.D.A. 618.

diseases in Wisconsin, U.S.D.A. 640.

hays of widely varying phosphorus content, availability to rats of phosphorus in, 85.

lime, P, and K needs, N.C. 473.

nutrients in, effect of soil fertility, Ind. 737.

seed stocks, differences in control field behavior, N.Y.State 186.

seed production tests, Pa. 619.

subterranean, leaf rust, reaction of varieties to, 772.

superior varieties or strains grown by station, Oreg. 619.

variety tests, Alaska 617, Miss. 186, 325, Tex. 42.

white—

disease studies in Alabama, 484.

diseases responsible for crop failure, 350.

genetics of self-compatibility in, 748.

importance in bluegrass pasture, Pa. 619.

mineral content of clones, grown on different soils, 759.

yields, crop rotation v. superphosphate for, Ark. 755.

Cnidioscolus macrogravii, new source of oil in Bahia, Brazil, 740.

Coal tar—

fractions as wood preservatives, 255.

products for insecticides, Pa. 652.

Cobalt, absorption and excretion by man, 279.

Coccarboxylase, paper on, 705.

Coccidia(um)—

intestinal, of rabbit, life cycle, 823.

new species pathogenic for chickens, 686.

Coccidioides immitis—

intranasal and intraperitoneal infection of mouse with, 677.

isolation from wild rodents and relation to coccidioidomycosis, 524.

Coccidioidomycosis in wild rodents, determining extent of endemic areas, 823.

Coccidiosis—

avian, chemotherapy in control, 814.

cecal, acquired resistance in chickens to, effect of sulfaguanidine on, 531.

experimental bovine, sulfaguanidine therapy in, 819.

in California valley quail during captivity, reducing, 251.

in cattle, U.S.D.A. 98.

in cattle and feed lot lambs, Mont. 676.

in chickens, 531, U.S.D.A. 98, Wis. 248.

in chickens, periodicity of oocyst discharge in, 248.

in sage grouse not transmissible to chickens, 531.

resistance by chickens, sulfaguanidine as prophylactic during period of acquirement, 826.

studies, Oreg. 676.

Coccophagus fuscipes, effect of dormant sprays on, 511.

Coccus pseudomagnoliarum, see Citricola scale.

Cochliomyia americana, see Screwworm.

Cochliomyia macellaria, see Screwworm, secondary.

Cochlosoma rostratum from turkey, 251.

Cocks—

hormonal induction of "broodiness" in, 377.

phospholipids of plasma, effect of diethylstilboestrol on, 802.

Cockerels—

fertility in, Mo. 322.

head appendages, effect on size of testes, 323.

semen production, seasonal variation, 377.

White Leghorn, effect of sunlight, dubbing, and fractionated anterior pituitary extract on, 613.

Cockroach(es)—**American**—

and German, relative resistance to pyrethrum spray, 782.

effects of infrared irradiation, 786.

fecundity, longevity, and parthenogenesis, 221.

nymphal development, 502.

riboflavin metabolism in, study of fluorescence microscopy, 658.

toxicity of sodium fluoride for, 365.

control, Nebr. 73.

development, effect of temperature, 222.

German, action of pyrethrum on, 786.

German, circulation of hemolymph in wings, 365.

poison, compound 4,6-dinitro-o-cresol as, 503.

Cockroach(es)—Continued.

sprays, new method of testing, 222.

v. pyrethrum, 221.

Cocoa—

cake meal, feeding value for pigs, 376.

fillings, effect on inhibiting growth of staphylococci, 408.

Coconut oil, substitutes for in making dipping chocolate, 241, 675.

Codling moth—

activity, effect of warm spring evenings, N.C. 499.

advance in British Columbia, 500.

biological control in South Africa, 506.

biology and control, Kans. 655.

combination sprays for, 782.

control, calyx spray in, 660.

control, developments in, 363.

control, efficiency of nicotine sprays for, 80.

control in British Columbia, 369.

control, studies, Vt. 506.

control, varietal interplanting in, 660.

damage, reducing to 3 percent, 225.

larvae, killing with low temperatures, 72.

larvae, newly hatched, toxicity of nicotine compounds to, 792.

larvae, overwintering, sprays for killing, 72.

larvae, toxicity of acid amides and their N-substituted derivatives to, 498.

larvae, toxicity of sulfanilamide and related compounds to, 498.

larvae, transforming, refrigeration test, 498.

new species of *Ephialtes* parasitizing, 510.

ovicidal value of light mineral oils, 360.

oviposition in mixed pear orchard, 506.

sprays, making effective, 363.

sprays, spreaders for, 792, N.Y.State 785.

spring brood, emergence and subsequent worm entry, time relations, 792.

studies, 219, 225.

supplementary control measures for, Va. 506.

toxicity of synthetic organic chemicals to, 782.

Cod-liver oil and egg oil, comparative rates of absorption of, 702.

Coelophora inaequalis, establishment, P.R. 655.

Coenzyme R, vitamin H, and biotin, review of literature, 863.

Coffea arabica, root system, studies, P.R.U. 198.

Coffee

"cock's-eye" disease, 778.

flowers, essential oils from, studies, P.R. 579.

grounds in animal rations, 285.

scale insects in Puerto Rico, relation to ants and other organisms, P.R.U. 223.

varieties, P.R. 628.

Coffee-sugar tablets for the Army, U.S.D.A. 723.

- Colamine, effect on growth and protoplasmic streaming in oats, 742.
- Colchicine—
 effects on cell division, 746.
 technic and results of induced polyploidy in black gram, 179.
 tetraploid tomato plants induced by, 179.
- Colchicum* susceptibility to colchicine, 463.
- Coleophora malivorella*, see Pistol case-bearer.
- Coleoptera, elm bark infesting, larval characteristics, 228.
- Colliform organisms and *Ericinia* spp., relation, 599.
- Collard breeding, Ga. 627.
- Colletotrichum*—
capsici, saltation in, 847.
destructivum isolates, variations in sporulation, 769.
- Colloid(s)—
 science, advances in, 149.
 soil, deferrated, flocculation and electrokinetic behavior, 723.
- Colloidal—
 clay composition, 301.
 material in Missouri soils, properties, Mo. 15.
 systems of soil, significance of Donnan equilibria for, 452.
- Color names, central notations of ISCC-NBS, 140.
- Colorado College notes, 427, 721.
- Colorado Station notes, 427, 721.
- Colts—
 draft, growth in, Mo. 84.
 goller in, prevention with iodized salt, Mont. 676.
- Combine harvesters in Missouri, Mo. 105.
- Commodities, domestic distribution, transportation, and storage, U.S.D.A. 841.
- Commodity Credit Corporation—
 report, U.S.D.A. 841.
 stabilization operations, 393.
- Commodity output, regulating, via multiple prices, 693.
- Community(ies), see also Rural community(ies).
 organization and adult education, 645.
 organization for war and for peace, 406.
- Comperiella bifasciata*—
 effect of tartar emetic on, 77.
 oriental races in California, comparison, 664.
 parasite of California red scale, 796.
- Complement fixation with neurotropic viruses, 816.
- Compost heaps, decomposition, changes in organic matter during, 597.
- Concrete—
 canal lining cured by sprayed coats of white-pigmented compound, 392.
 with minimum of steel, 689.
- Conifer(s)—
 crown gall, 359.
 newly transplanted, effect of wax emulsions on, Kans. 628.
- Conifer(s)—Continued.
 plantations, competition in, Vt. 56.
 seed germination studies, N.Y.State 200.
- Connecticut [New Haven] Station notes, 427.
- Conotrachelus*—
nenuphar, see Plum curculio.
 sp. on partridge pea, Ga. 654.
- Conservation practices as weapons of war, Okla. 693.
- Consumer education course for secondary schools, 543.
- Consumption in Britain, control of, 693.
- Cooperation, see Agricultural cooperation.
- Cooperative(s)—
 associations, principal types of egg and poultry handling by, Ohio 394.
 cotton gin associations, organization and operation, N.Mex. 120.
 elevator associations, percentages of members and directors that were tenants, Tex. 111.
 requirements for, N.Dak. 693.
- Cooperia* spp., percentage incidence in cattle, 101.
- Coot, American, parasites, 217.
- Copper—
 arsenate, basic, status as insecticide and fungicide, 782.
 arsenate, determination in treated wood, 154.
 chromate, determination in treated wood, 154.
 deficiency in ewes and stringy wool, 86.
 deficiency in plants, 60.
 dusts, performance, effect of inert ingredients, 484.
 effect on lipase activity in Cheddar cheese, 813.
 fungicides, compatibility with nicotine bentonite insecticides, 364.
 fungicides, fixed, adherence, effect of spray supplements, 346.
 intake, effects on cattle, 527.
 sprays, substitute for bordeaux, value against blight, Pa. 641.
 substitutes in fungicidal sprays, 206.
 value on soils in southeastern North Carolina, N.C. 446.
- Corcyra cephalonica* on milled rice, U.S.D.A. 73.
- Cork substitutes from residues, U.S.D.A. 723.
- Corn—
 absorption of selenium by, from *Astragalus* extracts and solutions containing proteins, 173.
 albino, culture, 171.
 and corn smut tumors, auxin extraction from, 61.
 and hog supplies and prices, control, U.S.D.A. 111.
 and sorghums and effects on succeeding crops, comparisons, Tex. 42.
 bacterial wilt resistance, bacteriophage sign of, Ohio 344.
 Belt hybrids, poor adaptation, N.C. 473.

Corn—Continued.

- bins, insects in, fumigating mixture tests, 502.
 biological value for dairy heifers, 90.
 borer, European—
 alternative insecticide for, N.Y.State 785.
 control, Conn.[New Haven] 499, 507.
 effect on reduction in corn yield, 507.
 in East North Central States, U.S.D.A. 80.
 in Iowa, 783.
 infestation, effect of growth stage of sweet corn, 782.
 nutrition studies, synthetic food media for use in, 508.
 on resistant and susceptible field corn, survival, weight, and location, 792.
 protecting market sweet corn from, U.S.D.A. 226.
 regression of in Quebec, 782.
 studies, Ohio 362.
 borer, southwestern—
 in sweet corn, Kans. 655.
 outbreak in Kansas, 783.
 breeding, Ga.Coastal Plain 325, Kans. 618, Miss. 186, Mo. 41, Mont. 618, Nebr. 41, Ohio 326, Tex. 42, U.S.D.A. 616.
 canned, production of staphylococcus enterotoxin in, 409.
 charcoal rot, Nebr. 59.
 composition, factors affecting, 21.
 culture tests, Ga.Coastal Plain 325, Kans. 618, Miss. 325, Mont. 619, Tex. 42.
 dehydrator for, Colo. 849.
 dent, resistance to *Diplodia zeae*, nature of, 487.
Diplodia macrospora leaf spot, U.S.D.A. 58.
 diploid, shoot apex and growth pattern of leaf blade, developmental relation, 747.
 diseases in Maryland, U.S.D.A. 203.
 dried distillers' byproducts in laying rations, 377.
 ear, ventilation of in metal cribs, Ohio 535.
 ears, number necessary for adequate sample at harvesttime, 621.
 earworm—
 control by birds, 369.
 control, mineral oil treatment, U.S.D.A. 226.
 hibernation, U.S.D.A. 798.
 in sweet corn, control, 660, Ark. 783, Kans. 655.
 studies, 78, Mont. 655, Nebr. 73, Tex. 78.
 effect of hormone treatments, Miss. 618.
 efficiency of tillage methods for, Mo. 41.
Euchlaena, and *Tripsacum*, genetic and cytological relations, Tex. 42.

Corn—Continued.

- fertilizer placement experiments, Mo. 41.
 fertilizer requirements, predicting, plant tissue tests v. soil tests, 185.
 fertilizer tests, Ga. 617, Ga.Coastal Plain 325, Kans. 618, Miss. 325, Tex. 42.
Fusarium moniliforme infection, effect of seed treatments, Mo. 59.
 futures, volume of trading, open contracts, and prices, U.S.D.A. 123.
 genetic studies, Mo. 41.
 grain, yellow, carotenoids of, 435.
 grain, yellow carotenoids of, spectrophotometric determination, 436.
 ground, as preservative for legume silage, Ohio 880.
 growth in, effects of translocation, 747.
 harvesting with hogs, Nebr. 41.
 heat, light, and drought tolerance in, Kans. 618.
Helminthosporium leaf blight of, U.S.D.A. 203, 640.
Helminthosporium turcicum leaf blight, unusual amount of damage by, U.S.D.A. 58.
 hogging off, Ga.Coastal Plain 373.
 hybrid(s)—
 adapted to Utah, Utah 620.
 and open-pollinated varieties, tests, Pa. 619.
 and varieties, yields, Miss. 755.
 development for Arkansas, Ark. 40.
 for silage, yields and time to harvest, Ill. 475.
 for victory and for profit, W.Va. 473.
 locally developed, superiority, N.C. 473.
 production, Iowa 608.
 production of own seed by farmers, N.C. 473.
 resistant to fungus diseases, development, Ohio 344.
 seed, disease infection, 484.
 tests, Miss. 618.
 inbred lines, convergent improvement with, 748.
 inheritance studies, Tex. 42.
 interplanting with legumes, Miss. 326.
 kernels, auxin in during ontogeny, from plants of varying heterotic vigor, 742.
 leaf aphid, notes, Mont. 655.
 leaf blight severe in Virginia, U.S.D.A. 343.
 leafhopper extract, sugarcane stem galls induced by, 502.
 lepidopterous pests in Trinidad, 661.
 morphological characters, use in forecasting yield, 760.
 mutants, association with homozygous deficiencies, 178.
 new hybrids ready for farm trial, Ohio 326.
 nutrients in, effect of soil fertility, Ind. 737.
 open-pollinated v. hybrid, for brood sows, Mo. 84.

Corn—Continued.

- origin, 25.
- origin, western Guatemala a secondary center, 177.
- plant juice, ovulating factor in, 91.
- plants, young, response to phosphates differing in solubility, 21.
- prehistoric, from Cañon del Muerto, 621.
- production, mechanical equipment, power, and labor for, Nebr. 105.
- protection from weevils, Miss. 409.
- Pythium* stalk rot, 772.
- reduction in yield by European corn borer, 507.
- residual effects from different levels of fertilizer, R.I. 326.
- response to fallow and other tillage practices, Nebr. 41.
- roasting, variety tests, Ga.Coastal Plain, 331.
- roots, lithium chloride toxicity in meristem cells, cytological studies, 317.
- rootworm, southern, in sweet corn, Kans. 655.
- rootworm, southern, studies, Ga. 654, Nebr. 73.
- rotation experiment, N.H. 187.
- sap beetle in rice, life history, 361.
- sap beetle on milled rice, U.S.D.A. 73.
- seed-borne micro-organisms, N.Y.State 203.
- seed, response to hormone treatment, N.Y.State 190.
- seed stocks offered for sale to New York farmers, merits, N.Y.State 186.
- seed treatment, effect on yield, Mo. 41.
- seedlings grown from X-rayed seeds, root modifications induced in, 170.
- shoot, developmental anatomy, 316.
- silage, *see* Silage.
- silks, receptiveness in, duration, 621.
- sirup, enzyme-converted, use in manufacture of bulk sweetened condensed milk, 674.
- sirup solids in ice cream, 240.
- smut resistance in hybrids, breeding for, 62.
- soil improvement crops for, Miss. 326.
- storage, studies, Ohio 392.
- substitutes for fattening cattle, protein supplements as, 513.
- sugar, new antiseptic agent from, U.S.D.A. 728.
- superior varieties or strains grown by station, Oreg. 610.
- sweet, *see* Sweet corn.
- varieties, Mich. 755.
- varieties and hybrids, relative performance, Ark. 755.
- varieties, growth curves, 603.
- variety tests, Ark. 755, Ga. 617, Ga.Coastal Plain 325, Kans. 618, Miss. 186, 325, Mo. 41, Mont. 618, Nebr. 41, Okla. 755, R.I. 326, Tex. 42.
- vitamin B₁ treatment, Kans. 618.
- waxy, starch from, U.S.D.A. 723.

Corn—Continued.

- waxy starch from, possible competitor for tapioca, 456, U.S.D.A. 617.
- whole kernel, frozen, determining maturity of, 150, 151.
- winter cover and green manure crops for, Ga.Coastal Plain 325.
- world production and trade, U.S.D.A. 123.
- yellow, storage, relation to vitamin A deficiency, U.S.D.A. 685.
- yields, crop rotation v. superphosphate for, Ark. 755.
- yields effect of green manure, Ark. 755.
- yields, high, from better hybrids and adapted varieties, Miss. 618.
- yields in western Iowa, effect of rainfall distribution and temperature, 621.
- yields, increase by turning under legumes, N.C. 473.
- Cornell University notes, 143, 429, 869.
- Cornstalk borer, lesser, studies, Ga. 655.
- Cornstalks—
 - handling for conversion into artificial manure, Mo. 105.
 - use in soil building, Mo. 15.
- Cornus sericea*, taxonomic study, 461.
- Corpus luteum* and follicle, method of growth in mouse ovary, 753.
- Corticium stevensii*, pure cultures, obtaining from sclerotia, 60.
- Corynebacterium*—
 - pyogenes* infection in cattle, abscess due to, 527.
 - recommended change of *Phytomonas* spp. to, 204.
- Coryneliaceae, revisionary studies, 311.
- Coryneum longistipitatum* development and fruiting, effect of temperature, 485.
- Coryza—
 - bacillus, hemophilic fowl, superior medium for, 824.
 - infectious, R.I. 384.
 - infectious, prevention and treatment with sulfathiazole, 386.
- Cotton—
 - and linen mixtures, analysis of linen in, 863.
 - angular leaf spot control, 484, Tex. 59.
 - aphid control, 361, 654.
 - aphid control, calcium arsenate with and without aphicides for, 362.
 - aphid control, effect on cotton yield, 363.
 - aphid control, insecticide tests for, 501, 502.
 - aphid control, rotenone with calcium arsenate for, 366.
 - aphid development, relation to fertilizers, 366.
 - aphid, effect of insecticidal drift in small plats, 361.
 - aphid studies, Ark. 72.
 - areas, soil losses and yields from, effect of compost, woods litter, and manure, N.C. 446.
 - Asiatic, anthocyanin pattern in, 606.

Cotton—Continued.

- boll rots and fungi associated with them, U.S.D.A. 640.
- breeding, Ga. 617, Ga.Coastal Plain 325, Miss. 325, Okla. 755, Tex. 42, U.S.D.A. 616.
- breeding for strength, N.C. 473.
- breeding, recent developments in, improvements resulting, N.C. 473.
- breeding, relation to taxonomy, 25.
- culture tests, Tex. 42.
- cytogenetics of, Tex. 42.
- disease(s)—
 - control, 485.
 - of Argentina, 643.
 - seed-borne, fungicide tests against, 209.
 - seedling, and wilts and nematodes, Miss. 203.
 - survey, U.S.D.A. 640.
- dress prints, analysis of qualities, 865.
- effect of hormone treatments, Miss. 618.
- farmers, use of credit by, Tenn. 120.
- farms, improvement of low incomes on, N.C. 537.
- fertilizer for maximum profits, rate and analysis, Miss. 618.
- fertilizer placement for, Ga.Coastal Plain, 325.
- fertilizer requirements, predicting, plant tissue tests v. soil tests, 185.
- fertilizer tests, Ga. 617, Ga.Coastal Plain 325, Miss. 325, Tex. 42.
- fiber, cellulose determination in, 290.
- fiber quality, effect of water relations within plant, N.C. 473.
- fibers, number of, determined by growing conditions at blooming, N.C. 473.
- fla hopper—
 - control, 654.
 - control in Louisiana, La. 362.
 - host relation, 228.
 - insecticide tests for control, 501.
 - predator on, 72.
 - studies, Ark. 72, Tex. 73.
- foliar hydration in, 605.
- gin associations, cooperative, organization and operation, N.Mex. 120.
- ginning costs in North Carolina, N.C. 402, 537.
- ginning services in South Carolina, quality, S.C. 402.
- growth on Delta soils, variation of fertilizer needs for, Miss. 454.
- hairy vetch as green manure crop for, 185.
- improved American Egyptian, U.S.D.A. 616.
- improved varieties, variation of fiber diameter in, N.C. 473.
- in rotation with peanuts, K needs of, N.C. 473, U.S.D.A. 617.
- in rotation with soybeans, less N in, U.S.D.A. 617.
- infection from acid delinted treated seed v. untreated fuzzy seed, Tex. 59.

Cotton—Continued.

- inheritance of perigynous heterotaxy and associated characters, 185.
- inheritance studies, Tex. 42.
- insects, hemipterous, control by dusts, 504.
- insects, studies, Ga. 654, Ga.Coastal Plain 362.
- irrigation tests, Calif. 328, Tex. 42.
- leafworm control, 654.
- leafworm, predator on, 72.
- leafworm studies, Ark. 72.
- leaves, mineral content, diurnal variations in, 744.
- leaves, withdrawal of water from fruit by, 30.
- lightning injury, 772.
- limed to different pH levels, minor elements for, Ga. 617.
- lint, for smokeless powder, U.S.D.A. 723.
- longer staple, breeding, Ark. 755.
- marketing in selected local markets, La. 121.
- marketing study, Ga. 693.
- mechanical harvesting, Tex. 105.
- N and K top dressings for, Ga.Coastal Plain 325.
- novel defense uses for, U.S.D.A. 723.
- nutrition studies, Ga. 617.
- of Oklahoma in wartime, production v. military requirements, Okla. 261.
- or boll weevils, U.S.D.A. 228.
- partition of mineral elements in, 605.
- pests, effect of arsenicals on, 361.
- pests, migration and control, 218.
- plant(s)—
 - asynaptic, and their polyploids, 467.
 - composition and uptake of nutrients at different growth stages, Ga. 760.
 - food requirements, Ark. 40.
- planter and fertilizer distributor, description, N.C. 534.
- prematurely killed by cotton root rot, yield and quality, effect of insect control on, 218.
- processing, for military uses, U.S.D.A. 723.
- produced in Oklahoma in 1941, quality, Okla. 261.
- quality, increase, N.C. 473.
- replacing imported fibers with, U.S.D.A. 723.
- residual effect of cotton burs and manure for, Tex. 42.
- response to fertilizers, correlation of chemical soil tests with, Ga. 595.
- root rot—
 - caused by *Thielaviopsis basicola*, 62.
 - control, U.S.D.A. 347.
 - effects of cropping and cultural treatments, 484.
 - studies, Tex., 59, 208.
- roots, cell proliferation and protoxylem differentiation in, effect of *L*-proline, 463.

Cotton—Continued.

roots, distribution, effect of soil preparation, Miss. 186.

roots, root pressures and injury to by cultivation, 185.

rotating with close growing crops, value, 184.

row width experiments, 760.

sea-island—

culture on Coastal Plain, Ga.Coastal Plain 188.

new strains of, U.S.D.A. 616.

production, development, Ga.Coastal Plain 325.

secondary nutrient elements for, Ga. Coastal Plain 325.

seed, *see* Cottonseed.

seedlings from reginned and acid-delinted seed, increase of, N.C. 473.

soil improvement crops for, Miss. 326.

sources of P for, with and without gypsum, Ga. 617.

strength tests, Miss. 325.

textiles, moisture in, volumetric determination, 572.

utilization of absorbed phosphate by, 453.

varieties adapted to mechanical harvesting, Tex. 42.

varieties, new, importance of seed purity in, N.C. 473.

varieties, reactions to strains of *Fusarium* wilt fungus, Ark. 59.

varieties, spinning tests, Okla. 756.

varieties, strength differences in, estimating, 185.

variety tests, Ga. 617, Ga.Coastal Plain 325, Miss. 186, 325, Mo. 41, Okla. 755, Tex. 42.

variety-wilt-tests, regional, Ga. 617.

Verticillium wilt, U.S.D.A. 640.

vetch and other green manures for, Tex. 42.

wilt and root knot resistant varieties, Tex. 59.

wilt in Alabama, 63.

wilt-resistant varieties best control for wilt, N.C. 473.

winter cover and green manure crops for, Ga.Coastal Plain 325.

yield after green manures and sorghums v. commercial N, Miss. 326.

yield, effect of boll weevil and cotton aphid control, 363.

yield, effect of green manure, Ark. 755.

yield, increasing by disease control, Ark. 769.

Cottonseed—

and fertilizer, efficiency in distribution and placement, Tex. 105.

cake v. corn in fattening ration for calves, Miss. 86.

diseases, transmission, 484.

disinfection in wartime, 208.

dusting, effect on emergence of seedlings in *Rhizoctonia* infested soil, 642.

Cottonseed—Continued.

fuzzy and acid-delinted, effect of depth of planting, 484.

germination, effect of soil disturbance and machine placement of fertilizer, Tex. 328.

improvements in cultural practices, U.S.D.A. 617.

in storage, quality elements, effect of artificially drying seed cotton, U.S.D.A. 43.

meal—

ash as fertilizer, 168.

feeding, effect on milk properties, 808.

in large quantities for pigs, Miss. 86.

in place of corn for milk production, Okla. 808.

new grade authorized, Tex. 373.

profitable supplement to reeds for finishing yearling steers, N.C. 514.

replacement value in good dairy ration, 519.

moisture in, relation to germinability and presence of *Aspergillus wentii*, 487.

more effective materials for treating, N.C. 473.

rate of application of Ceresan to, U.S.D.A. 640.

treated and untreated anthracnose-infested, comparison, Ga. 617.

treated with growth substances, root initiation by seedlings from, Tex. 42.

treatment for anthracnose control, Mo. 59.

treatment for seedling blight and boll rot, Ark. 59.

treatment tests in 1941, results, 484.

treatment with dust preparations, 484.

treatment with fungicides, 208.

treatment, studies, 484, Okla. 769.

Cottonwood protein for adhesives, Miss. 154.

Counter, electric, for consecutive counting of small objects, 317.

Country, *see* Rural.

Covariance analysis by method of individual comparisons, 669.

Cover crop(s)—

growth, phosphorus and potash, needs to maintain, Pa. 628.

seed production, Oreg. 619.

winter, culture experiments, Ga.Coastal Plain 325.

winter, variety tests, Ga.Coastal Plain 325.

Cover-glass preparations, staining rack for handling, 317.

Cow(s)—*see also* Cattle and Helpers.

beef, finishing and wintering rations, Miss. 231.

dairy—

artificial insemination in, Mo. 34.

Cow(s)—Continued.**dairy—continued.**

effect of sulfanilamide administration, 681.

irrigated pasture for, 807.

oat and pea silage as substitute for cured hay, Alaska 686.

rations, minerals and vitamins in, Miss. 238.

Hereford beef, pastures for wintering and breeding, Ga.Coastal Plain 372.

improvement in breeding and fertility by ascorbic acid administration, 35.

irradiation, effect on milk, Ohio 380.

lactating, rations for, Tex. 92.

limited-grain feeding and all-year pasture for, Tenn. 238.

manure as source of vitamins for chicks, 518.

milk production, *see* Milk production.

ovulation, relation to oestrus, 183.

udders, *see* Udder.

wintering, pea vine silage, alfalfa hay, and wild hay for, Oreg. 666.

Cowpea(s)—

breeding, Tex. 42.

cultural tests, Miss. 186.

curculio, studies, Ga. 654.

diseases, Ga. 640.

fertilizer tests, Ga. 617.

mineral content, effect of environment, Ga. 699.

plants, variations in ascorbic acid and dry matter at different times of day, 313.

root knot susceptibility, Tex. 60.

root-nodule production, relation to sulfur, Tex. 60.

variety tests, Ga.Coastal Plain 325, Kans. 618, Miss. 325.

Crab apples, French, selection of cold-resistant seedlings, Kans. 628.

Crab meal, nutritive properties and use, 377.

Cranberry—

growth and fruiting, 340.

storage, lower temperature tests to reduce loss, 190.

Crayfish meal, nutritive value, 231.

Cream—

analyses, Me. 545.

bacteriological examination methods compared, 674.

churning, pasteurization, developments in, 239.

free fatty acids in, effect on butter quality, 808.

freezing for storage, 239.

frozen, as source of fat in ice cream, Mich. 675.

frozen, storage, 807.

frozen, used in ice cream, reducing oiling off, 241.

grading study, 807.

mold in, 807, 808, Okla. 808.

mold mycelia growth in, treatments affecting, 91.

Cream—Continued.

quality in, counts of mold mycelia for, Ark. 797.

quality, relation to bacteria from water sources, 239.

refrigerated and pasteurized, development of positive phosphatase test on, 91.

supply, farm, control of mold in, Ark. 96.

variously treated, keeping quality, 91.

visual mold test for under Kansas conditions, 812.

Creamery(ies)—

cooperative in South Dakota, S.Dak. 269.

water supplies, bacteriological studies, 92, 380.

Creatine formation in chicks, 237.

Credit bureaus from consumer's point of view, 718.

Crepis species, cytological methods for, 607.

Cress, hoary, root system, Kans. 618.

Cricket, Mormon, control, Mont. 655.

Cronartium ribicola, *see* White pine blister rust.

Crop(s)—*see also* Forage crops and specific kinds.

and fruit tree responses on phosphate-deficient soil, 631.

canning, diseases, survey, N.Y.State 203.

canning, seed decay, damping-off, and root rot, effect of environmental conditions, N.Y.State 203.

disease-resistant, breeding, 203.

effects on succeeding crops, R.I. 328.

equipment investment and crop acres, relation, Mo. 110.

forecasts of good harvest for, Miss. 142.

growing days at Tifton, Ga.Coastal Plain 299.

grown on North Carolina soils, effect of vitamin B₁ on, 619.

in Bulloch Co., labor and power needs on, Ga. 538.

in rotation, fertilizer tests, Tex. 42.

irrigated, yields, effect of manure, alfalfa, and pastured sweetclover on, Nebr. 41.

irrigation tests, Okla. 756.

of Hawaii, boron in, 24.

ornamental greenhouse, growing in gravel culture, Ohio 341.

plants, resistance to insect attack, Kans. 655.

production, increase by conservation measures, U.S.D.A. 396.

reports, U.S.D.A. 124, 540.

residues, use for soil defense, U.S.D.A. 24.

response to potash fertilization, relation to plant available potassium, 453.

rotation and sequence experiments, Tex. 42.

rotations, *see* Rotation of crops.

seedtime and harvest, U.S.D.A. 261.

vetch and other green manures for, Tex. 42.

Crops(s)—Continued.

- water requirements, determining by tensiometers, U.S.D.A. 504.
- yields and composition, effect of borax, 307.
- yields and day length, U.S.D.A. 607.
- Cropland, abandoned, regrassing, Mont. 619.
- Crotalaria spectabilis*—
 - canker disease associated with *Sclerotium*, U.S.D.A. 343.
 - immunity to root knot, U.S.D.A. 640.
- Crotalaria* variety tests, Ga.Coastal Plain 325.
- Crown gall—
 - tissue, autonomous bacteria-free, studies, 204.
 - tumors, secondary, bacteriological sterility of tissues derived from, 774.
- Cryolite—
 - as insecticide, La. 362.
 - larvicidal value, effect of lime and lime-sulfur on, 500.
- Cryptogams, carotenoid pigments of, 310.
- Crystal Lake, California, reclamation with rotenone, 658.
- Crystal violet, improved cytological methods with, 607.
- Crystallography and plant viruses, 204.
- Cube, toxicity to plant bugs, effect of additions of sulfonated oil on, 787.
- Cucumber(s)—
 - analysis, Mich. 850.
 - bacterial wilt, Ohio, 344.
 - beetle control, Mo. 72.
 - breeding for the South, 627.
 - culture, Mont. 628.
 - flower development and structure, effect of fertilization and pruning, Ark. 46.
 - genetics of, 627.
 - greenhouse, diseases, 491.
 - growth, effect of soil temperature, Mo. 46.
 - leaf disease control by Cu dusts, N.C. 485.
 - mosaic virus, resistance to, 66.
 - pests, studies, 218.
 - pickles, analysis, Mich. 850.
 - pickles, pasteurization, death rate of micro organisms during, 295.
 - production problems, symposium, 295.
 - seed stocks, tests, N.Y.State 191.
 - seed treatments, Tex. 59.
 - seedling damping-off resistance, relation to age, season, and N nutrition, 65.
 - spacing and fertilizer tests, Miss. 191.
 - varieties for greenhouse culture, development, Ohio 331.
 - variety tests, Ga.Coastal Plain 331.
- Cucurbit—
 - diseases, control, 484.
 - downy mildew, U.S.D.A. 58.
 - seeds and isolated cotyledons, gaseous exchange, 315.
- Culex tarsalis*—
 - encephalitis viruses from, 385.
 - vector of St. Louis encephalitis, 816.

- Culture change in southern Illinois, 697.
- Cupric chloride crystallization patterns, modification by traces of proteins, 580.
- Curinus* sp., control of scale insects by, P.R. 655.
- Curly top virus studies, U.S.D.A. 640.
- Current(s)—
 - diseases, control, N.Y.State 203.
 - golden, new source of carotene, 855.
 - leaf spot control with bordeaux spray, N.Y.State 215.
 - phosphorus and calcium in, 133.
- Curtain fabrics, glass, studies, Ohio 426.
- Curvularia lunata*, notes, Tex. 60.
- Cuscutas, new, from western North America, 360.
- Custard and cream fillings, effect of ultraviolet radiation and ozone on bacteria in, 408.
- Cutter for spectroscopic electrodes, 6.
- Cutworm(s)—
 - army, notes, Mont. 655.
 - control, R.I. 362.
 - pale western, notes, Mont. 655.
- Cylas formicarius elegantulus*, see Sweetpotato weevil.
- Cylindrocarpon chrenbergii* on alfalfa and sweetclover, varietal resistance to, 349.
- Cylindrocopturus furnissi* on Douglas fir, 791.
- Cylindromyia porteri*, receipt of shipment of, P.R. 656.
- Cypripedium* fruits, intermittent growth, 33.
- Cysteine—
 - estimation, colorimetric micromethod for, 558.
 - formation from homocysteine and serine by liver tissue of rats, 724.
 - formation from homocysteine by liver tissue, 724.
 - sulfur, enzymatic conversion of radioactive sulfide sulfur to, 727.
- Cystine—
 - added to casein diets, lactation-promoting properties, Ark. 284.
 - as supplement to all alfalfa hay ration for milk production, 93.
 - dietary, effect of liver lipids of rats, 703.
 - estimation, colorimetric micromethod for, 588.
 - relation to choline requirement of rats, 279.
 - synthesis in rumen of sheep, possibility, 234.
- Cytochrome c, quantitative determination, 589.
- Cytophaga* spp., notes, 305.
- Cytospora abietis*, cause of fir canker, 71.
- Dactylis glomerata*, variations in chromosomal association and behavior during meiosis, 747.
- Dactylum dendroides* in mushroom soil, control with chloropicrin, 355.
- Daedalia contragosa*, unusual development of fruit bodies, 27.
- Dahlias, variety test, Ga. 627.

Dairy—

cattle and dairy cows, *see* Cattle and Cows.

farm(s)—

fertility needs of crops, N.H. 187.

income, factors affecting, Nev. 539.

use of electric power on, Utah 257.

glassware, checked for accuracy, N.Y. State 728.

herd, adequate and economic housing, 808.

manufacturing short courses, manual for, 383.

operations, applications of newer phosphates in, 520.

opportunity areas in New Hampshire, N.H. 539.

plants, efficiency of fat removal by, Vt. 520.

problems, overcoming, Mich. 808.

production, fly control, nitrogen, and silage studies affecting, Kans. 671.

products—

analyses, Me. 545.

concentration of dissolved oxygen in, method for measuring, 91.

consumption in metropolitan New Jersey, N.J. 842.

consumption, relation to quality, 807.

effect of water bacteria on quality, 238.

fats in, oxidative deterioration, U.S.D.A. 671.

fluorescent bacteria in, Mo. 92.

judging for flavor, sensory adaptation as factor, 92.

oxidized flavor, mechanisms of, 92.

production, increasing after the war, 796.

quality, path to, 520.

scoring, State-wide, summary, 520.

value in nutrition, 378.

quality improvement, organizing work of fieldman, 520.

rations containing grain, efficiency, Iowa 809.

rations, use of home-grown roughages in, Ga. 671.

sanitation, new frontiers in, 520.

sires, *see* Bull(s) and Sires.

Dairying—*see also* Creamery(ies), Butter, Milk, *etc.*

research, 808.

Damping-off—

control by use of sphagnum, N.J. 646.

in *Pinus resinosa*, chemical control, 651.

injury to seedlings, effect of drying soil on control, Pa. 628.

of broadleaf seedlings, Nebr. 59.

Dandelion, Russian, growing, progress in, Colo. 768.

Dark adaptation—

and blood plasma levels of vitamin A tests, comparison, 282.

and vitamin A, effect of alcohol, benzadrine, and vitamin C, 552.

Dark adaptation—Continued.

and vitamin A studies with biophotometer, 283.

measurements, for diagnosing vitamin A deficiency, 414.

measuring, comparison of methods, 283.

of children, relation to dietary levels of vitamin A, 709.

relation to vitamin A in blood, 552.

Dasyscaphus parvipennis, rearing and liberation, P.R. 656.

Dates—

dried, souring, 11.

effect on urinary acidity and blood alkali reserve, 277.

fungus spoilage, relation to structural and chemical factors, 358.

yeasts on, 358.

Day length—*see also* Photoperiodism.

and crop yields, U.S.D.A. 607.

Deer—

browse and acorns as emergency foods, Pa. 652.

footworm of northern Rocky Mountain region, 245.

new nematode from, 384.

Virginia, albinism in, 472.

Deficiency diseases, *see* Diet deficiency and specific diseases.

Dehydration—

methods used in California, 440.

of foods, U.S.D.A. 699.

of foods in wartime, 439, 849.

of fruits and vegetables, 440.

of fruits and vegetables by farmers' co-operatives, U.S.D.A. 404.

of meat on production basis, 439.

of olives, 850.

of Texas-grown vegetables, research on, 849.

Dehydrator plan for preserving nutritive value in drying food, Colo. 849.

Delphinium(s)—

perennial, leaf variegations of, Calif. 778.

perennial, virus disease caused by California aster yellows virus, Calif. 69.

powdery mildew, reaction of species to, 358.

ring spot, Calif. 70.

susceptibility to six viruses, Calif. 779.

Demand deposits in Oklahoma, Okla. 261.

Dematophora neoatrix, notes, 348.

Democracy, challenge to, Iowa, 845.

Dendroctonus—

brevicornis, *see* Pine beetle, western.

monticolae, *see* Pine beetle, mountain.

piceaperda, *see* Spruce beetle, eastern.

Department of Agriculture, *see* United States Department of Agriculture.

Dermacentor—**andersoni—**

lethal temperatures for, in British Columbia, 372.

microbial flora of, 512.

Rickettsia-like organism from, 242.

toxic principle in eggs of, 372.

- Dermatitis**, rat, interrelation of factors involved, 860.
- Derris**—
chronic toxicity of, 220.
toxicity to plant bugs, effect of additions of sulfonated oil on, 787.
- Derris elliptica**—
culture and physiology of, P.R. 629.
roots, critical examination, 783.
- Desert**—
North American, life forms and flora, 25.
soils, microbial oxidation of ammonia in, Ariz. 451.
- Desserts**, frozen, sanitation of, neglected phase, 520.
- Devil's shoestring** as insecticide, Tex. 73.
- Diabrotica duodecimpunctata**, see Corn root-worm, southern.
- Diaminocarboxylic acid** from biotin—
adipic acid as oxidation product, 726.
effect on yeast growth, 711.
- Diamondback moth**—
larvae control on collards, 782.
notes, Mont. 655.
tachinid parasitic on, 661.
- Diaphania nitidalis**, see Pickleworm.
- Diapsis boisduvalii**, life history and control on cattleya, 76.
- Diatraea**—
grandiosella, see Corn borer, southwestern.
saccharalis, see Sugarcane borer.
- Dicalcium phosphate**, fluorine in, toxicity, 704.
- Dicotylopus**—
flaria infesting domestic sheep, Wyo. 245.
viviparus, life history, 680.
- Diet(s)**—see also Food(s) and Nutrition.
adequate, at low, moderate, and liberal-cost levels, revised plans for, U.S.D.A. 718.
artificial, successful rearing of second generation mice on, 411.
average American, studies, 414.
deficiency diseases, symposium on, 565.
effect on uric acid excretion of young children, 410.
hospital, 131.
low-cost, experience with, 275.
of children, see Children.
of high school students of low-income families, 547.
role in blood regeneration, Minn. 549.
- Dietary**—
analysis, short method for, 275.
deficiencies, combating with enriched and fortified foods, S.C. 565.
deficiencies, multiple relation to hypochromic anemia, 277.
factors, new, essential for growth in guinea pigs, 705.
institutional, use of dry-milk solids in, 699.
- Dietetics** for clinician, 852.
- Diethylstilboestrol**—
effect on plasma phospholipids of cock, 802.
possibilities for use in dairy cattle, 91.
- Digestive tracts**, avian, pH in, 236.
- Digitalis**, drug plant chemistry of, P.R. 579.
- Diodotyrosine**, in vitro formation by thyroid tissue, 726.
- Dill** pickles with more eye appeal, N.C. 441.
- Dinitro-o-cresol** estimation, 654.
- Dinitro-o-cyclohexylphenol** estimation, 654.
- Dinoderus minutus**, studies, P.R. 656.
- Diocophyme renale**, anthelmintic efficiency of Ficln against, 247.
- Diparopsis castanea** studies, 226.
- Diphenylene sulfide**, chronic toxicity to albino rat, 389.
- Diphtheria**, calf, treatment with sulfonamides, 102.
- Diplodia**—
natalensis from stained wood and other sources, comparison, 360.
natalensis on citrus trees, 215.
pinca, cause of disease of Scots pine, associated with pine spittle bug, 651.
- Diprion hercyniae**, see Spruce sawfly, European.
- Diptera**, myiasis-producing, seasonal distribution, 81.
- Dipylidium caninum**, anthelmintic efficiency of Ficln against, 247.
- Dirofilaria immitis**, anthelmintic efficiency of Ficln against, 247.
- Discussion group** pamphlets for rural areas, U.S.D.A. 543.
- Disease(s)**—
deficiency, see Diet deficiency diseases and specific diseases.
of animals, see Animal diseases and specific diseases.
of plants, see Plant diseases and specific host plants.
- Disinfectants**, role in war program, 657.
- Distemper**—
canine, distemperoid virus as immunizing agent against, 684.
canine, studies, U.S.D.A. 98.
in ferrets, studies, 247, 530.
inclusion bodies, 684.
inclusion bodies as aid in diagnosis, 103.
- Distillers'**—
byproducts in swine rations, 513.
dried solubles as vitamin supplement for chicks, 376.
- Dithiocarbamic acid** derivatives as pesticides, 206, 526.
- Ditylenchus dipsaci**, notes, 343.
- Dog(s)**—
anthelmintic activity of Ficln in, 246.
coat color inheritance in, 35.
diseases and parasites, U.S.D.A. 98.
nicotinic acid deficiency in, 668.
nutrition, vitamin B complex in, 87.
tick, American, parasite of squirrel, 498.
tick, brown, important house pest, 664.
ventricular musculature and lung parenchyma, electrolyte composition, 590.
vitamin requirements, 800.
- Dog fly** breeding in shore deposits of bay grasses, control, 371.
- Dogbanes**, rubber from, N.Dak. 623.

- Dogfish meal as protein supplement, value, Wash, 236.
- Dogwood species, taxonomic study, 461.
- Dolichopodidae, new, from Utah and Colorado, 226.
- Dollar spot control in Minnesota, U.S.D.A. 640.
- Dothidella ulai* on rubber trees, U.S.D.A. 341.
- Dough, colloidal properties, factors affecting, Kans. 579.
- Dourine eradication, U.S.D.A. 676.
- Dourine, studies, U.S.D.A. 97.
- Dove, mourning, ecology and management, 217.
- Doves, transformation of males to intersexes by oestrogen treatment of ovarian eggs, 40.
- Drain tile, proper size, depth, and spacing for Missouri soils, Mo. 105.
- Drainage—
ditches, open, effect of grazing in maintaining, 184.
field, principles of, 532.
in San Joaquin Valley, possible effect of new irrigation project, 304.
relation to victory program of agriculture, 107.
tile, unprofitableness on some soils, Ohio 301.
- Drepanothrips reuteri*, economic importance and biology, 75.
- Drosophila melanogaster*, wild population, heterogeneity in lethal mutation rate in, 749.
- Drug plants—
native and naturalized of Virginia, 309.
of tropical and subtropical regions, U.S.D.A. 55.
production, U.S.D.A. 627.
- Drug store weevil—
in insect nests, 73.
wood-boring by, 72, 498.
- Drugs, analyses, Me. 545.
- Duck(s)—
eggs, studies, 378.
of North America, life history, 653.
pif of digestive tracts of, 236.
- Dusts, fungicidal and insecticidal effectiveness, improvement, N.Y.State 258.
- Dysdercus superstitionus*, biology, 787.
- Dysentery or scours in young lambs, Mont. 676.
- Ear tick, spinose, newly introduced pest, Mont. 652, 655.
- Earth—
and man, a human geography, 699.
walls, rammed, soil admixtures for, 253.
- Earthworms—
of northeastern U. S., key, with distribution records, 361.
possible intermediate hosts of *Capillaria caudinflata*, 384.
- Earwig, European, notes, Mont. 655.
- Earwigs, invasion of houses by, 654.
- Echinochloa* spp. of Argentina, 740.
- Ecological problems of southeastern coastal plain, 311.
- Economic planning in a democratic society 536.
- Economics, legislative and administrative reasoning in, 393.
- Ectophasiopsis arcuata*, receipt of shipment of, P.R. 650.
- Edenia in chicks on low vitamin E rations 804.
- Education, adult, and community organization, 845.
- Egg(s)—
and poultry meat for export, U.S.D.A. 723.
and poultry situation outlook for 1943, Mich. 800.
biotin and avidin distribution in, 417.
blood spots in, effect of season and heredity, 377.
brown shelled hen and turkey, time of pigment deposition in, 614.
consumer demand in resort areas of western Michigan, Mich. 695.
cooler, evaporative, Nebr. 105.
coolers, Miss. 231.
cooling methods, 257.
dried, nutritive value, Kans. 660.
farm prices, Mo. 110.
feed ratio, Mo. 110.
fresh, black rot in, 379.
fresh, fertility in, X-ray radiation in detection, 377.
handling, types of, by cooperative associations, Ohio 394.
hatchability—
and yolk mobility, Mich. 669.
effect of biotin in rations, 237.
effect of feeding dehydrated green feeds, Mo. 84.
effect of soybean meal, 377.
relation to diet, 376.
relation to fat in diet, 518.
hatching results, relation to size of clutch and position of egg, Mo. 34.
interior quality after storage, effect of processing by oiling, 377.
keeping quality in cold storage, effect of prestorage treatment, Mo. 84.
oil and cod-liver oil, comparative rates of absorption of, 702.
origin and structure of vitelline membrane of yolk, 805.
pounds of feed purchasable for definite number, Mo. 110.
powder, spray-dried, storage changes in, 806.
preservation, 805.
preservation by drying and oiling shells, U.S.D.A. 665.
preservation without refrigeration, U.S.D.A. 723.
producers, Pacific coast, interpretation of "parity prices" for, Calif. 112.

Egg(s)—Continued.

- production — *see also* Hens, laying.
 and hatchability, effect of vitamin B₁₂, 804.
 and mortality, relation to environment, Mo. 84.
 annual, decline with age, 472.
 behavior of hens, N.J. 802.
 effects of nicotine sulfate and kamala on, Ark. 797.
 in Maine, Me. 398.
 increasing after the war, 796.
 on large-scale farms, Miss. 838.
 relation to oils in ration, U.S.D.A. 665.
 relation to time of hatching, Mo. 84.
 rough rice v. corn for, Ark. 83.
 wartime, importance of livability, 377.
 winter, effect of environment, Mo. 84.
 research program in Canada, 130.
 shape, inheritance, 376.
 shell strength, potential hatchability and chick viability, relation, 518.
 shell treatment by oiling, effect of time interval, 805.
 shell treatment studies, Kans. 666.
 storage cabinet, insulated water cooled, Nebr. 105.
 structure and quality, 670.
 transportation to Connecticut cooperative associations, efficiency, [Conn.] Storrs 841.
 vitamin A in, effect of dehydration, 856.
 washing, effect on hatchability, Mo. 84.
 weight, effect of boiling, 805.
 white, *see* Albumin, egg.
 with olive yolks, acorns as cause of, 519.
 yolk color and role of pigments in poultry nutrition, Kans. 666.

Eggplant—

- Phomopsis* blight, breeding for resistance to, R.I. 331.
 seed stocks, tests, N.Y.State 191.
 virus-induced "yellows," Tex. 60.

Egys platycephalus, control of scale insects by, P.R. 655.

Eimeria—

- brunetti* n.sp., pathogenic for chickens, 686.
nieschulzi growth-promoting potency of feeding stuffs, nature of, 241.
 sp., parasite of squirrel, 497.
wyomingensis, new coccidium from cattle, 819.

Elasmopalpus lignosellus, *see* Cornstalk borer, lesser.

Electric—

- appliances for saving farm labor, Pa. 688.
 power on Nebraska farms, Nebr. 105.
 power serves the dairy farm, Utah 257.

Electrodes, spectroscopic, cutter for, 6.

Electron micrographs of protein molecules, 746.

Elements, minor, absorption and excretion by man, 279.

Elevator associations, cooperative, percentages of members and directors that were tenants, Tex. 111.

Elm(s)—

- bark beetle, smaller European, economic importance, 782.
 bark beetles control, Conn.[New Haven] 499.
 disease, Dutch, control, Conn.[New Haven] 499.
 felled, *Ceratostomella ulmi* from insects attracted to, 784.
 logs treatment against bark beetle, 782.
 Siberian, in Plains country, effect of Nov. 1940 freeze, 200.

Elsinoc—

- ampelina*, notes, 357.
 new species, 25.

Embryonic development, parallel, in rat and its bearing on superfetation, 470.

Empoasca—

- fabae*, *see* Potato leafhopper.
filamenta, biology and control, 75.
 leafhopper on alfalfa, effect of sulfur with other materials, 782.
 spp., trap-light studies, 75.

Encephalitis—

- and mosquitoes in Yakima Valley, Washington, 385.
 eastern and western equine and St. Louis types, 816.
 St. Louis, *Oulex tarsalis* as vector, 816.
 St. Louis, virus, relation to equine encephalitis problem, 246.
 virus of fox, histologic adaptation, 247.
 western equine, clinical findings in, 242.
 western equine, in Canada, 385.

Encephalomyelitis—

- eastern equine, studies, 386.
 epidemic in man in Saskatchewan, 385.
 equine—

- brain tissue, phenol as preservative, 100.
 control, 814.

- induced resistance of central nervous system to experimental infection, 386.

- sources and carriers of virus, 386.

- studies, Kans. 676, U.S.D.A. 97, 676.
 western, human cases in Manitoba epidemic, 242.

- western, in infants, 242.

- western, isolation of virus from pigs, 822.

Immunity induced in horses by vaccination, longevity, 683.

sporadic bovine, Tex. 99.

sporadic bovine, filtration of causal agent, 101.

Venezuelan equine and eastern, western, and Argentine virus, cross-immunity studies, 529.

Endamoeba histolytica, filth flies as transmitters, 370.

- Endoconidiophora* on London plane tree, control, N.J. 651.
- Endothia parasitica* on chestnut trees in California, behavior, 650.
- Engineering, agricultural—
in India, 252.
introduction to, 687.
suggestions for 1943, Mich. 827.
work of State experiment stations, 251.
- Enteritis—
in swine, U.S.D.A. 98.
infectious, in swine, sulfaguanidine in treatment, 246, 684, 821.
necrotic, control, U.S.D.A. 665.
- Enterohepatitis, infectious, *see* Blackhead.
- Enterotoxemia of lambs, Tex. 99.
- Entomological nomenclature, status, 499.
- Entomologists of Connecticut, reports on conference of, Conn. [New Haven] 499.
- Entomology—*see also* Insect(s).
American economic, Index VI to literature, 498.
college, 781.
economic, significance of taxonomy in, 499.
systematic, needs of, 499.
treatise, 218.
- Enzyme activity from -70° to 50° C., kinetics as function of temperature of, 289.
- Ephialtes cydiae* n.sp., description, 510.
- Epicalima coloradella*, inhabitant of perennial apple canker, 369.
- Epicausta vittata*, *see* Blister beetle, striped.
- Epilepticlike fits in pyridoxin-deficient rats, 558.
- Epitrix cucumeris*, *see* Potato flea beetle.
- Equine breeding hygiene, 814.
- Erebos odora* in British Columbia, 500.
- Ergot—
chemistry, pharmacology, and toxicology, 175.
germination, 740.
life history in New Zealand, 175.
sources for drug purposes, U.S.D.A. 58.
- Eriophyes caryae* on pecan, 783.
- Eriosoma lanigerum*, *see* Apple aphid, woolly.
- Erosion, *see* Soil erosion.
- Ervonia—
carotovora, cause of orchid soft rot, 649.
phytophthora, notes, 63.
spp. and coliform organisms, relation, 599.
- Erynnia nitida*, biology, 362.
- Erysiphe graminis*, protoplasmic continuity in, 642.
- Erythrocyte sedimentation, survey of literature, and measurement, 676.
- Erythroneura*, *see* Grape leafhopper.
- Escherichia*—
coli, dissimilation of phosphoglyceric acid by, 309.
n.spp., recognized, 457.
spp. in factory-packed ice cream, 96.
- Ethanolamine, dietary, effect on liver lipids of rats, 703.
- Ethnobotany, medical, of Navajo Indian, 460.
- Ethylene dichloride—
emulsion as used for peachtree borer, effect on peach trees, 782.
toxicity against confused flour beetle, 505.
- Eucalyptus* spp. and their volatile oils in a province of Ecuador, 310.
- Euchlaena, Tripsacum*, and corn, genetic and cytological relations, Tex. 42.
- Euphorbia—
lathyrus, proteolytic enzyme in latex of, 29.
spp., rubber from, N.Dak. 624.
- Eutettia—
taxonomic revision of genus, 658.
tenellus, *see* Beet leafhopper.
- Eutrombicula alfreddugesi*, *see* Chigger.
- Ewes—*see also* Sheep.
Hampshire, mineral mixture to increase lamb production for, N.C. 514.
native v. western for lamb production, N.C. 514.
oestral phenomena in, experimental modification, 610.
oestrus and ovulation in, induction of, Mo. 34.
onset of oestrus following period of sexual inactivity, nature of, 324.
plainbodied stud, standard of wool production, 668.
pregnancy disease, Oreg. 528.
Rambouillet, fineness of fiber in eight sampling areas, 513.
range, selection, importance of body weight in, 233, 798.
range, wintering on grain hay and alfalfa hay, Oreg. 666.
types of spring lamb production, 797.
- Experiment stations—*see also specific stations*.
challenge to, by wartime problems, Colo. 867.
cooperative, in Latin America, 722.
research on war problems in the home, U.S.D.A. 287.
use of tests of significance in, 867.
- Extension work, measuring results in, 513.
- Fabraea maculata*, notes, Mo. 59.
- Fabric(s)—*see also* Textile(s).
breaking strength, 422.
factors affecting life of, 573.
for women's and children's clothing, colorfastness of, 864.
for war, 863.
glass curtain, studies, Ohio, 426.
methods for evaluating hand of, and for determining effects of finishing processes, 572.
military, mildew-proofing, 864.
mixed, wool in, quantitative determination methods, 421.
mothproofing tests, 656.
pests, rearing, 656.
sewing, and dress, dictionary and digest of, 425.

Fabric(s)—Continued.

- stain removal from, home methods, U.S.D.A. 286.
- treatise, 863.

Factory payrolls in United States, Okla. 261.

Family—see also Farm family(ies).

- classification, and cost of living, Nev. 718.
- composition in selected areas of U. S., statistics, Mo. 124.
- life, parent-adolescent adjustment in, measurement and significance, 125.
- life studies, Nebr. 142.
- living under rural-urban situation, food consumption, 426.
- spending and saving, relation to age of wife and number of children, U.S.D.A. 141.

Fans, electric ventilation, Pa. 688.

Farm(s)—

- accounts, twelve years of, Ill. 401.
- adjustment opportunities in Greene Co., Ga. 836.
- adjustment opportunities in Washington Parish, La., U.S.D.A. 396.
- adjustments, Miss. 537.
- animals, *see* Livestock and Animal(s).
- building, post-war, program for, 834.
- buildings, sales turn-over and types, conditions, etc., Mo. 110.
- buildings, treatise, revised, 393.
- buildings, type, relation to land class. Mich. 267.
- cotton-corn, increasing incomes and conserving resources, Ala. 113.
- Credit—see also Agricultural credit.**
 - Administration, report, U.S.D.A. 264.
- debt adjustment through F. S. A., Mich. 264.
- electricity on, *see* Electric.
- equipment, integration into war effort, 583.
- equipment, minimum requirements for 1943, estimating, 108.
- facts, methods of sampling, Iowa 111.
- facts, searching for, N.Dak. 720.
- family(ies)—*see also* Family.
 - clothes for, planning, Miss. 718.
 - expenditures for family living, Kans. 719.
 - new-ground, and those on long-cultivated family-size farms, comparison, 843.
 - of South Carolina, food habits, S.C. 548.
 - of Vermont, incomes and expenditures, Vt. 141.
 - socially participating white, clothing supplies, Miss. 424.
- family-sized, in the backwater area, problems, U.S.D.A. 113.
- financial returns, crop yields, livestock sales, etc., Mo. 110.

Farm(s)—Continued.

- improvements, concrete, without use of reinforcing steel, 689.
- in limestone area, management, Ind. 837.
- income, effect of reorganization and price changes, Ark. 114.
- income from different products, percentage, Ohio 394.
- indebtedness, interest charges payable on, U.S.D.A. 265.
- labor—
 - hired, in World War II, 693.
 - improving efficiency for wartime demands, 252.
 - needs, Miss. 537.
 - problem, wartime, backgrounds of, U.S.D.A. 541.
 - requirements of Arizona, Ariz. 541.
 - skill requirements, relation to type of farming, Okla. 693.
 - supply, wartime, in United Kingdom, U.S.D.A. 124.
- land values, decrease from 1927 to 1933—38, Mo. 110.
- lands, methods of renting, Ohio 394.
- leadership of Iowa townships, social and ecological patterns in, Iowa 698.
- lease, stock-share, Kans. 399.
- leases, written, use of, Tex. 111.
- loans, short-term, made by Ohio country banks, characteristics and cost, Ohio 264.
- lumber requirements, U.S.D.A., 830.
- machinery, *see* Agricultural machinery.
- management—
 - livestock manual, 272.
 - problems associated with production goals, 536.
 - program for 1943, essentials of, Mich. 839.
 - research, 40 years of, 393.
- market outlets for home industries, Ark. 126.
- milk and egg production on, Miss. 838.
- mortgage experience in Kent Co., analysis, Del. 265.
- mortgages and foreclosures on lands of different soil types, Mo. 110.
- of Kansas, organization and operation, factors affecting, Kans. 693.
- of Nebraska, electric power on, Nebr. 105.
- organization—
 - and enterprise study in Bulloch Co., Ga. 693.
 - and financial returns, Oreg. 114.
- owners and their farms, characteristics, Okla. 261.
- parity prices, U.S.D.A. 270.
- population during 1940, changes in, Tex. 111.
- prices of Indiana, seasonal variations, Ind. 841.
- prices of North Dakota, tables, N.Dak. 394.

Farm(s)—Continued.

production, increasing, with reduced man power, 533.
products, *see* Agricultural products.
real estate—

investments, success of farmers with, Mo. 110.

market, emergency control in, 603.
recent changes in tax rates on, N.C. 538.

situation, 1939-42, U.S.D.A. 537.

record-keeping and random-sample, statistical comparisons, Iowa 693.

records of Iowa, data from 1920 to 1940, Iowa 694.

Security Administration—

borrowers, farm income and expenses of, U.S.D.A. 396.

clients in southeast Missouri, physical status and health, Mo. 405.

farm debt adjustment by, Mich. 264.

sizes and types, relation to farm income, N.Mex. 837.

structures—

for storing crops, U.S.D.A. 827.

gearing to war effort, 109.

prefabrication, 835.

preparation for improvement or replacement of, 687.

surpluses, international agreements for control, U.S.D.A. 124.

taxation, *see* Taxation and Tax(es).

tenancy—*see also* Land tenure.

problem, solution of, 536.

tenants and farm laborers in southeast Missouri, physical status and health, Mo. 405, 406.

tenure law in Kansas, Kans. 399.

upland, in Chase Co., types of organization for, Kans. 537.

woodland products, equipment and methods for harvesting, U.S.D.A. 57.

work and war, U.S.D.A. 111.

Farmer(s)—

and the war, U.S.D.A. 270.

attitudes, studies, 698.

handbook, revision and enlargement, 719.

low-income, economic problems of, Iowa 604.

production intentions in 1943, R.I. 694.

production rating under wartime conditions, 830.

successful, reasons for, Va. 114.

Farmhouses, southern, temperatures in, factors affecting, U.S.D.A. 109.

Farming—*see also* Agriculture.

cropper, in Coastal Plain, N.C. 694.

dairy, *see* Dairy farm(s).

efficiently under war conditions, S.C. 835.

in Cedar Creek Soil Conservation Demonstration Area, analysis, N.C. 394.

in Tompkins Co., 30 years of, [N.Y.] Cornell 898.

livestock system, value for maintaining soil fertility, Okla. 737.

Farming—Continued.

mountain, in Ozark area of Arkansas, U.S.D.A. 396.

new land in Yazoo-Mississippi Delta, U.S.D.A. 113.

of additional land, effect of size of farm units, Ohio 837.

peasant, in India, 894.

problems in wartime, U.S.D.A. 835.

returns in Jackson Co., factors affecting, Fla. 836.

stubble-mulch, for soil defense, U.S.D.A. 596.

types, relation to labor skill requirements, Okla. 693.

wartime, crops for, W.Va. 473.

wartime, on northern Great Plains, U.S.D.A. 261.

wartime, on southern Great Plains, U.S.D.A. 261.

Fashion, language of, dictionary and digest, 425.

Fat(s)—*see also* Oil(s).

animal, preventing rancidity in, U.S.D.A. 723.

metabolism and vitamin B complex, 136.

of white rat, development of rancidity in, effect of dietary factors, 582.

phenols in, estimation, 589.

promoting oxidation of, 433.

synthesis and metabolism, effects of biotin, 555.

Fatty acids—

essential, significance of, 701.

free, in cream and effects on butter quality, 808.

free, in milk fat, determination, 7.

methylated, synthesis, 583.

resistance to neutralization, 808.

Feathers, grinding, methods, U.S.D.A. 665.

Feces, vitamin A and carotenoids in, determination, 153.

Feed production, effects of crop acreage control by A. A. A. in Midwest States, Iowa 111.

Feeding experiments—*see also* Cow(s), Pig(s), etc.

group, net energy values, advantages, 514.

Feeding stuffs—

analyses, Me. 667, R.I. 667, Vt. 85.

Eimeria neschulzi growth-promoting potency, nature of, 241.

for wartime livestock, N.H. 231.

inspection, Ind. 798, Mass. 798.

inspection and analyses, Conn.[New Haven] 373, Ky. 373, N.H. 373.

Fence—

electric, improved single-impulse, 256.

post tests, Miss. 342.

posts, treating with chromated zinc chloride, 216.

Fencing and wire, atmospheric exposure, Tex. 106.

Fermate—

new Du Pont fungicide, 206.

Fermate—Continued.

new spray for tobacco, downy mildew, 352.

Fern poisoning in cattle, Oreg. 676.

Fertility, dietary requirements for, 420, Ark. 284.

Fertilization, subsoil, possibilities in, 24.

Fertilized plats, resampling, 57.

Fertilizer(s)—

acid-forming, neutralizing with dolomitic limestone, effect on response of cotton to potash, Ga. 739.

applicator, accurate, for field test plats, 476.

availability and efficiency, factors affecting, Ark. 737.

band-placing in irrigated beds, experimental mechanism, 763.

commercial, wartime recommendations on use, Mo. 454.

complete, needed by soils of south Mississippi, Miss. 599.

cooperative manufacture and distribution by small dry-mix plants, U.S.D.A. 122.

determination of K_2O in, 7.

efficiency, relation to liming, 454.

experiments, Mo. 15, Nebr. 15.

high-analysis, U.S.D.A. 594.

inspection and analyses, Ind. 739, Mass. 739, Me. 599, N.H. 454, Tex. 599, Vt. 454.

mixed, water solutions of, for starting and side dressing plants, N.J. 168.

more efficient use of, Colo. 738.

neutralized with limestone, effect of fineness, N.C. 446.

nitrogenous, *see* Nitrogenous fertilizer.

non-acid-forming, Tex. 599.

organic, carbon-nitrogen ratios in, relation to availability of their nitrogen, 597.

placement, N.Y.State 191.

ratios, small whole number, fertilizer triangle for, 455.

substitute, because of war restrictions, Miss. 159.

tests, *see special crops*.

utilization during 1943, Miss. 738.

wartime, for New Jersey, N.J. 168.

Fescue—

Alta, for pasture and hay, seeding practices and seeds, N.J. 187.

Alta, grazing studies, Mont. 619.

red, burning tops to control "silvertop," Pa. 619.

seed, imported, *Epichloe Typhina* on, 487.

Fiber(s)—

diameter and wool quality, relation, 421.

identification stain, 422.

imported, replacing with cotton, U.S.D.A. 723.

mixtures, chemical analysis, 420.

new, from casein, 285.

substitute, use of, U.S.D.A. 716.

synthetic, and textiles, Kans. 140.

Fiber(s)—Continued.

types, as substitutes for jute and manila fibers, 866.

Ficin, anthelmintic activity in dogs, 246.

Pidia vitticida, *see* Grape rootworm.

Fig(s)—

canker in Brazil, 493.

Croisc (Cordelia), history, distribution, fruiting behavior, etc., 199.

enzymes of, 728.

souring, yeasts in, 493.

variety tests, Ga.Coastal Plain 331.

Filbert worm—

parasites, 796.

studies, Oreg. 655.

variability of diapause in, 79.

Films of U. S. Department of Agriculture, catalog and price, U.S.D.A. 699.

Filter-cake compost, 24.

Filth flies as transmitters of *Endamoeba histolytica*, 370.

Financial—

operations of special improvement districts, Ark. 266.

problems in wartime, U.S.D.A. 835.

Fir—

crown gall, 359.

Douglas—

cork, decay in, 780.

cultural identification of fungi causing decay in, 780.

minor weevil pest, 791.

plantations, vital statistics for, 639.

round coast timbers, sapwood depth and absorption limits, 254.

seed from young trees, 200.

Fire ant, vector of *Shigella flexner* V infections, 671.

Fire insurance companies, farmers' mutual, size and efficiency, U.S.D.A. 268.

Fire-retardant chemicals, corrosion studies with, 255.

Firebrat—

insecticidal action of pyrrolines and pyrrolidines on, 365.

toxicity of ethide to, 782.

Fireproofing standards for pressure-treated lumber, 255.

Fires, forest, *see* Forest fires.

Fischoederius elongatus in a calf, experimental infestation with, 245.

Fish—

and meat meals, protein quality, Mass. 798.

meal for growing and fattening pigs, Ohio 87.

meal, nutritive value, 231.

oil, vitamins A and D potency, 706.

Fisher, gestation period in and protection in California, 652.

Fishery products, home canning, 849.

Flax—

and related bast fibers, microscopic structure, 670.

as winter crop for south Texas, Tex. 42.

breeding, Kans. 618, Mont. 618.

Flax—Continued.

- culture tests, Mont. 619, Tex. 42.
- diseases, 487.
- diseases, seed-borne, evaluation of seed disinfectants for, 350.
- procuticium development in, morphological and cytological study, 747.
- rust in Western Australia, 209.
- rust resistance, breeding for, 488.
- rust-resistant varieties, N.Dak. 329.
- stem break and browning in New Zealand, 209.
- variety tests, Kans. 618, Mont. 618, Nebr. 41, Tex. 42.
- wilt or fusariosis in Argentina, 488.
- worm studies, Oreg. 655.

Flea beetle(s)—

- injury to tomato transplants, reduction of, 782.
- on cigar-wrapper tobacco, control, 504.
- pale-striped, studies, Ga. 651.
- studies, Tex. 73.

Fleas—

- of dogs and cats, U.S.D.A. 98.
- of North America, classification, identification, and geographic distribution, U.S.D.A. 663.
- poultry, sulfur for control, Fla. 250.

Flies—

- around unsprayed cows, daily and seasonal behavior of, 783.
- biting, transmission experiments of *Anaplasma marginale* by, 217.
- common to Europe and North America, classification, 662.
- house, *see* Housefly(ies)
- in country and town, control, 654.

Flood—

- control study made in mountains, N.C. 446.
- water conservation for range improvement, Mont. 688.

Floor coverings, felt-base, maintaining in home kitchens, 718.**Flora(s)—*see also* (Plant(s) and Vegetation. of Colorado, mycorrhizas associated with, 741.**

- of the world, geographical guide, U.S.D.A. 169.
- State, of United States, 741.

Florida Station notes, 868.**Flour—*see also* Bread.**

- baking characteristics, Nebr. 5.
- beetle, black, in insect nests, 73.
- beetle, confused—
 - in insect nests, 73.
 - on rice, U.S.D.A. 73.
 - toxicity of certain chemicals as fumigants, 505.
- beetle, red—
 - mineral oils and tar oils for, 217.
 - on milled rice, U.S.D.A. 73.
- enrichment or fortification, background of, 128.
- enrichment, problems in, 151, 152.

Flour—Continued.

- moth, confused, in rolled oats packaged in cardboard cartons, cause of infestation, 782.
- peanut, southern bread enriched with, 699.
- quality, chemical factors affecting, Kans. 579.
- starch and amylase in, Nebr. 5.
- wheat, quantity and quality, tempering factors affecting, Kans. 579.
- white, milled by stone milling process, thiamin in, 857.
- white, thiamin in, 436.

Flower(s)—*see also* Plant(s), flowering, and Plant(s), ornamental.

- culture in cloth houses, Ohio 331.
- cut, solutions for prolonging life, Ohio 331.
- excessive fertilizer applications, effect, Ohio 331.
- greenhouse, gravel and cinder culture, Ohio 331.
- rooting in sterile culture, 20.
- thrips studies, Tex. 73.

Fluorescent substance, new, urinary excretion of, effect of pyridoxin, 280.**Fluoride, effect on rat caries and on composition of teeth, 568.****Fluorides, removal from public water supplies, 532.****Fluorine—**

- acquired by mature dog's teeth, 569.
- compounds useful in insect control, Tenn. 785.
- in dicalcium phosphate, toxicity, 704.
- problem in livestock feeding, 514.
- topically applied, effect in dental caries of children, 567.

Follicle and corpus luteum, method of growth in mouse ovary, 753.***Fomes annosus* on red cedar, effect of light, 779.****Food(s)—*see also* Diet(s).**

- Administration, British, U.S.D.A. 123, 130.
- analyses, Me. 545.
- and beverage analyses, 406
- and family living, textbook, 543.
- balance, prewar, of continental Europe, U.S.D.A. 124.
- bars, concentrated, experiments on, 274.
- classification and factors for conversion of packaging units to pounds, 845.
- commodities, relation to agricultural production goals, U.S.D.A. 718.
- composition and comparison of analytical with calculated values of diets, 846.
- conservation measures, U.S.D.A. 699.
- control of enzymes to conserve, U.S.D.A. 723.
- dehydrated, grading method, 440.
- dehydrated, specialties, 205.
- dehydration, in wartime, 439, 849.
- dehydration of, U.S.D.A. 699.

Food(s)—Continued.

- drying for victory meals, U.S.D.A. 130.
- for health in Hawaii, Hawaii 277.
- fortification, 564.
- fortification, for combating dietary deficiency, S.C. 585.
- fortified, symposium on, 564.
- from the garden, 130.
- frozen, and civilian food supply, 272.
- frozen, cabinets, domestic type, performance, 287.
- frozen, quality, factors affecting, 158.
- habits and nutrition conditions of Virginia people, Va. 276.
- habits of South Carolina farm families, S.C. 548.
- habits of the State, R.I. 701.
- home preparation and preservation, 272.
- in various types of containers, capacity of insects to attack, 781.
- nation's, 407.
- natural, in American dietary, 274.
- needs of young adults, Ohio 409.
- nutritive value, analytical and compilation data, U.S.D.A. 699.
- of India, vitamin B₁ in, 709.
- paper on, 394.
- perishable, paper for packaging, public health compliance, 12.
- poisoning organisms, N.Y.State 149.
- policy, scientific, 546.
- preparation by owner and cropper white and Negro families, Miss. 409.
- preparation, problems, contribution of applied research to, 272.
- prepared, vitamin content, 281.
- prices, retail, rise in Puerto Rico, P.R.U. 696.
- processed, fate of enzymes in, 850.
- processing, Ga. 700, N.Y.State 149.
- production—
 - and nutrition in Great Britain, 545.
 - and western ground water, U.S.D.A. 827.
 - campaign in England, use of farming machinery, 107.
 - wartime, and the agricultural engineer, 827.
- products, stored, insect pests in, 650.
- protein value, improving, U.S.D.A. 723.
- quick-frozen, nutritive value, 700.
- research program in Canada, 130.
- riboflavin in, 557.
- riboflavin in, fluorimetric estimation, 591.
- selection for between-meal feeding in industry, 130.
- spoilage and multiplication of bacteria in water, 294.
- storage for winter, W.Va. 534.
- supply of India, U.S.D.A. 123.
- technology, outlines, 845.
- trace elements in, 853.
- vitamin content, variations in, Tex. 127.

Foot-and-mouth disease, 678, U.S.D.A. 97.

Foot-and-mouth disease and starling, 387.

Forage—

- and mixtures for grass silage, merits, R.I. 326.
 - crop diseases, studies, Kans. 640.
 - crops, fertility needs and cultural practices for, Mich. 755.
 - crops, variety tests, Ga.Coastal Plain 325.
 - green, digestibility trials in Trinidad, 667.
 - improvement on sagebrush-grass range for increased wartime meat production, Colo. 757.
 - mineral composition, effect of rainfall, Okla. 756.
 - Texas range, carotene content, 798.
 - yields, effect of gypsum, S, and subsoiling on, Tex. 42.
- Forest(s)—**
- area, estimating from aerial photograph index sheets, 202.
 - cover and soil freezing, 452.
 - cutting plats, Adirondack, results of second remeasurement, 483.
 - fires, effect on ponderosa pine region of Pacific slope, 639.
 - future of, U.S.D.A. 768.
 - grazing and beef cattle production, Ga. Coastal Plain 232.
 - grazing and beef cattle production in the Coastal Plain, N.C. 115.
 - hardwood, need of sustained yield practices for maintaining, Ark. 768.
 - humus layers in New York, fauna of, [N.Y.]Cornell 498.
 - humus layers in Ohio, 597.
 - insect(s)—
 - damage, estimation of, 219.
 - situation in eastern Canada, 656.
 - survey of Canada, 363.
 - natural-seeded and planted, thinning and related silvicultural practices in, Vt. 483.
 - plantations, natural reproduction in, Vt. 483.
 - plantations, Rainbow, progress report, Conn. [New Haven] 768.
 - plantations, survey, Ohio 342.
 - products statistics of Central and Prairie States, U.S.D.A. 57.
 - protection activities, Ohio 342.
 - site determination by soil and erosion classification, 201.
 - soils, origin, properties, relation to vegetation, and management, 452.
 - species, sulfuric acid treatment of hard seeds of, N.Y.State 200.
 - State, recreational developments in, Ohio 342.
 - trees, *see* Tree(s).
 - virgin upland, of central New England, 483.
 - wealth and vegetation of Ecuador, 169.
- Forestry—**
- enterprises and livestock on farms in Ozark region, Ark. 115.

Forestry—Continued.

- farm, in Lake States, an economic problem, U.S.D.A. 638.
- farm, studies, Miss. 342.
- in wartime, U.S.D.A. 768.

Forsythia suspensa, formation of adventitious roots, 457.

Foulbrood, American—

- colony resistance to, mechanism, 82.
- queen rearing for resistance to, Tex. 73.

Fowl(s)—see also Chick(s), Chicken(s), Hens, Poultry, etc.

- bred for resistance to lymphomatosis, critical test of strains, 749.
- feather development in, 322.
- Frizzle, form and function in, 469.
- keel development, effect of rations, U.S.D.A. 665.
- ovulation in, experimental induction, 377.
- paralysis, *see* Paralysis.
- pox infection in chick, effect of quinine on course of, 531.
- pox studies and chick vaccination tests for, Oreg. 825.
- shank-growth ratios, failure of selection to modify, 749.
- tick, U.S.D.A. 98.
- weight at 8 weeks, relation to length of life, Mo. 84.

Fox(es)—

- blue, viability of internal parasite ova, Alaska 652.
- Chastek paralysis in, pathology, 248.
- chromosomes of, 319.
- encephalitis virus, histologic adaptation of, 247, 823.
- in Massachusetts, late fall and winter food of, 360.
- male, germ cell studies in, 750.
- production, equipment, feeding, and breeding, Oreg. 652.
- pups, blue, ophthalmia in, Alaska 652.
- silver, experimental nicotinic acid deficiency in, 390.

Frankliniella—

- bratleyi* n.sp., description, 222.
- fusca*, *see* Tobacco thrips.
- helianthi* on peas, unusual injury, 72.
- tritici*, *see* Flower thrips.

Freezer locker—

- plants, facilities and services, Pa. 540.
- utilization, Pa. 700.

Freezing v. canning, 295.

Frogs and toads of United States and Canada, handbook, 654.

Frost injury, artificial, in tree branches, apparatus for production, 29.

Frosts, killing, dates, Ga.Coastal Plain 299.

Fructose in blood, determination, skatole color reaction for, 589.

Fruits(s)—see also Orchard(s), Apple(s), Peach(es), etc.

- and vegetable dehydrator, Nebr. 105.
- as sugar savers in candy making, 10.
- ascorbic acid in, factors in processing affecting, 713.
- bar for Army K ration, 274.

Fruit(s)—Continued.

- canning methods, Calif. 409.
- citrus, *see* Citrus.
- concentrates and their use, 156.
- dehydrated, packaging, N.Y.State 157.
- dehydration, 440, N.Y.State 287.
- dehydration by farmers' cooperative associations, U.S.D.A. 404.
- dehydrator design, developments in, 534.
- diseases on Chicago market in 1940-41, U.S.D.A. 343.
- diseases, studies, Kans. 640.
- dried cut, retention of color and sulfur dioxide, 11.
- dried, insects infesting, control, 784.
- drop, preharvest, nuphtaleneacetic acid to prevent, Oreg. 628.
- drop, preharvest, sprays for, 194, Okla. 763.
- freezing preservation, 848, N.Y.State 272.
- freezing procedures, 272.
- fresh and canned, quality, relation to retail prices, Ohio 394.
- fresh, canned, and dried, after the war, 536.
- fresh, complementarity relations between, 393.
- fresh, selling cooperatively, U.S.D.A. 404.
- garden, home, U.S.D.A. 194.
- glacé, preparation, N.Y.State 272.
- gray mold studies, 775.
- harvest, forecasting time of, by blooming dates, N.Y.State 194.
- home canning, U.S.D.A. 129.
- home drying, U.S.D.A. 130.
- in custard fillings, effect on *Salmonella* organisms and staphylococci in, 408.
- industry problems of 1943, Mich. 765.
- insect problems in 1941, 363.
- insect studies, N.Y.State 218.
- juice(s)—
 - and beverages, preparation and preservation, N.Y.State 149.
 - ascorbic acid and sulfur dioxide determination in, 294.
 - blends, demonstration sale, results, 10.
 - home preparation and preservation, N.Y.State 129.
 - making in small lots, N.Y.State 274.
 - pectinized, preparation for use in ribbon ice cream, 522.
 - vitamin content, N.Y.State 272.
- marketing, Kans. 693.
- moth, oriental—
 - control, 782.
 - control on dormant nursery stock, 506.
 - control on quinces, N.Y.State 785.
 - in Uruguay, biology, 660.
 - parasites, alternate hosts, Conn. [New Haven] 499.
 - possibility of control with insecticides, 363.
 - studies, 219, Tex. 73.

Fruit(s)—Continued.

- new and improved, breeding, N.Y.State 193.
- phosphorus and calcium in, distribution, 138.
- plants, effect of November 11, 1940, freeze, Nebr. 47.
- plants in Illinois, injury from November 1940 freeze, 49.
- preparing for frozen food lockers, 700.
- preparing for overseas shipment, U.S.D.A. 723.
- processing for food, U.S.D.A. 723.
- production textbook, 631.
- products and byproducts, new, U.S.D.A. 723.
- relation of percentage of margin to sales and attractiveness of display to sales, Ohio 394.
- riboflavin determination in, 437.
- ripening, effect of ethylene, Oreg. 628.
- ripening, time interval after full bloom, N.Y.State 194.
- seed germination in, effect of choice of parent, 479.
- small, ascorbic acid in, 861.
- small, diseases in Idaho, Idaho 493.
- stone, orchard identification of root-stocks, 481.
- storage, Ga. 627.
- studies with, Tex. 47.
- sulfuring, absorption and retention of SO_2 , 154.
- tree(s)—
 - and field crop responses on phosphate-deficient soil, 631.
 - injury from Midwest blizzard of November 1940, 49.
 - leaf roller studies, 219.
 - lepidopterous pests and their parasites in Ireland, 661.
 - manganese in leaves, 631.
 - phosphate nutrition, 631.
 - photosynthesis rate, relation to leaf structure, Kans. 628.
 - stone, bacterial diseases, in Britain, 214.
 - winter injury of 1941-42, extent and remedy, Mich. 776.
- tropical, studies, 32.
- use of commercial fertilizers for, Mont. 628.
- varieties for irrigated central Washington, 191.
- varieties, new, tests, Okla. 763.
- variety tests, Ga.Coastal Plain 331, Miss. 331, N.Y.State 193.
- vitamin content, N.Y.State 272.
- wartime marketing problems of, Ark. 841.
- wastes, industrial products from, U.S.D.A. 723.

Fruitlet(s)—

- feeding preference, laboratory method for evaluating, 794.

Fruitlet(s)—Continued.

- Mediterranean—
 - activity at cold temperatures, 662.
 - on mature green papayas, 794.
- Mexican—
 - in Illinois, 361.
 - toxicity of tartar emetic to, 795.
- Fumigacin, an antibacterial substance, production, 26.
- Fumigants, toxicity against confused flour beetle, 505.
- Fumigation, application of aerosol to, 220.
- Fungi(us)—
 - and thiamin, interaction, 602.
 - antagonistic, distribution in nature and antibiotic action, 740.
 - aquatic, role in hydrobiology, 310.
 - cultural variations in, genetic interpretations, 25.
 - diseases and fungicides, developments during past 75 years, 345.
 - from Mount Shasta, new and interesting, 601.
 - fruiting, relation to balance between concentrations of glucose and vitamin B_1 , 602.
 - growth, and pyrimidine analog of thiamin, 312.
 - identified for plant disease fighters, U.S.D.A. 640.
 - marine cellulose-destroying, occurrence and significance, 310.
 - phylogeny, problems in, 27.
 - production of bacteriostatic substances by, 601.
 - spores, germination, relation to controlled humidity, 346.
 - spores, isolating from exposed slides in aerobiological work, 641.
 - population stock medium for, 310.
 - vitamin deficiencies of, 741.
 - vitamins in, 28, 705.
 - wood-rotting, on British hardwood trees, 781.
- Fungicidal—
 - action, mechanism, 205.
 - sprays substitutes for copper and zinc in, 206.
- Fungicide(s)—*see also* Spray(s) and specific kinds.
 - adhesion to plant surfaces, N.Y.State 149.
 - and fungus diseases, developments during past 75 years, 345.
 - assay, spore germination methods, effect of time in, 641.
 - chemistry of, 657.
 - copper, *see* Copper.
 - eradicator, toximetric study, 345.
 - evaluation, biological technic, 350.
 - flow, dependence on density, Ohio 844.
 - new, called Fermate, 206.
 - new, seed treatment tests of, N.Y.State 203.
 - properties, physical and chemical, analysis and evaluation, N.Y.State 149.

- Fungicide(s)**—Continued.
 relation to national defense program, 344.
 use during wartime, 770.
 varying of copper deposits from, Ohio 344.
- Fur animals**—
 diseases of, U.S.D.A. 99.
 production and diseases, Oreg. 652.
- Furnaces, household, wood-burning conversion unit for, Conn.[New Haven] 535.**
- Furniture beetles, notes, 654.**
- Fusarium**—
avenaceum on alfalfa and sweetclover, varietal resistance to, 349.
ovense on banana, 494.
equiseti, cause of water-hyacinth leaf spot, 781.
lutei on flax in Argentina, 488.
moniliforme ear rot in sweet corn, U.S.D.A. 343.
oxysporum narcissi stimulation by growth substances and nitrogen bases, 495.
solani cumartii, susceptibility of *Solanum* sp. from Chile to, 352.
solani martii f. 2 on peas, N.Y.State 66.
trichothecoides, alcoholic fermentation in vivo, effect of diphosphopyridine nucleotide, 770.
 wilt of *Albizia* spp. 780.
 wilt of radish, 355.
 wilt resistance of tomatoes, Tex. 59.
 yellows of beans, 350.
- Fusoidium dendriticum*, see Apple scab.
- Fusoidium salicoides* on willow, 497.
- Fusobacterium* strain, cell-wall and protoplasm in, 459.
- Gabardines, rayon, colorfastness and properties, effect of resin finishes, 717.**
- Galacturonic acid**—
 constituent of bacterial gum, 457.
 decomposition by intestinal bacteria, 569.
- Garden(s)**—
 dry land, U.S.D.A. 627.
 fall and winter, needed to supply war foods, Miss. 191.
 farm, U.S.D.A. 763.
 flea hopper of tomatoes, Tex. 73.
 home vegetable, insect control, N.J. 784.
 insect control, Okla. 783.
 irrigation tests, Okla. 756.
 Victory, U.S.D.A. 763.
- Garlic**—
 diseases, Tex. 60.
 drying, Tex. 106.
 mosaic, U.S.D.A. 58.
- Garments, serviceability, effect of differences in cotton fibers and harvesting methods, Tex. 140.**
- Gases, respiratory, movement through waxy coatings, studies, 607.**
- Gastralgia in a horse due to bot infestation, 823.**
- Geese**—
 of North America, life history, 653.
- Geese**—Continued.
 rearing on grass alone and with supplementary feeding, 237.
- Genes, in similar areas of chromosomes, morphological effects, 182.**
- Geography, physical elements of, 443.**
- Georgia**—
 Coastal Plain Station notes, 288, 575.
 Coastal Plain Station report, 426.
 Station notes, 143, 868.
 Station report, 719.
 University notes, 288.
- Geraniol, pure, preparation, 657.**
- Ginger culture, P.R. 628.**
- Glaciers and perennial snow, 736.**
- Gladiolus**—
 bulb rots, *Papulaspora* spp. associated with, 70.
 thrips control, substitutes for tartar emetic and brown sugar in, 782.
 thrips on carnations in greenhouses, control, Wash. 503.
 triploid, chromosome number in progeny of, 749.
- Glanders, U.S.D.A. 97.**
- Hecosporium olivarium*, cause of olive disease, 493.**
- Gluconic acid production, repeated recovery and re-use of *Aspergillus niger* in, 726.**
- Glucose v. triacetin as nutrient in feeds, 797.**
- Glutathione, synthesis of aspartic acid analog, 582.**
- Glycerol, synthetic and natural, bacteriological comparison, 176.**
- Glyoxalase, coenzymes for, 584.**
- Glyptometopa* and related genera, new genera erected and new species, 664.**
- Goat, Clear Lake**—
 emergence habits, 226.
 overwintering larvae, effect of larvicides on, 498.
- Goat(s)**—
 and sheep, crosses between, cytological studies, Tex. 35.
 Angora, inheritance of type in, Tex. 35.
 Angora, v. lamb wethers, fattening in dry lot, Tex. 85.
 blind halves in udder, 94.
 breeding, management, and judging, 230.
 dairy, disease, Oreg. 676.
 dairy, improved, care and management, 521.
 dairying as use for low-grade land, U.S.D.A. 396.
 dairying, directions for, 811.
 diseases and parasites, U.S.D.A. 98.
 experimental test and mammary development and lactation, 470.
 for clearing pastures, Okla. 797.
 growth, milk production, and energy metabolism, Mo. 92.
 kids, newborn, thyroid enlargement in, 683.
 lactating, basal energy metabolism, Mo. 92.

Goat(s)—Continued.

- lactating, effect of stilboestrol and anterior pituitary extract, 678.
- milk and fat production, effect of thyroxine, Mo. 34.
- milk, bacteriological quality, procedures affecting, 821.
- respiratory quotient in, effect of fasting and refeeding, Mo. 92.
- transference of genes for fineness of fiber from non-Angora to Angora, Tex. 35.

Golter—

- in newborn pigs, lambs, calves, and colts, prevention with iodized salt, Mont. 678.
- parenchymatous, in newborn goat kids, 683.

Gonadotropic hormones, effects on immature fowl gonads, 614.

Gonadotropin, urinary, effects in prepuberal male rats, 752.

Gonads, increase in weight following injection of male rat pituitary, 751.

Gonorrhodiella highti on diseased American beech in Canada, 650.

Gontozus indicus, biology, 793.

Gooseberry diseases, control, N.Y.State 203.

Gourd, luffa or "dishrag," culture, handling, and uses, U.S.D.A. 332.

Governments of Ohio, sources of revenue, Ohio 537.

Grains(s)—*see also* Cereal(s) and Oat(s), Rye, Wheat, etc.

- and corn silage rations, U.S.D.A. 670.
- beetle, flat, on milled rice, U.S.D.A. 73.
- beetle, saw-toothed—
 - in insect nests, 73.
 - on milled rice, U.S.D.A. 73.
- bin burning, prevention, U.S.D.A. 723.
- bin construction, plywood for, 259.
- borer, lesser, on rice, U.S.D.A. 73.
- containing tarweed seed as poultry feed, 685.
- drying, insect survival in, 784.
- elevators, average margins on grain and supply business, Tex. 111.
- feeding, profitable levels for, Mont. 671.
- germinating, carbohydrate-enzyme relations, Nebr. 41.
- improvement in yield by use of lime, Pa. 595.
- marketing, Kans. 693.
- milling industry in Knoxville trade area, Tenn. 403.
- mites control in British Columbia, 500.
- mites, taxonomy, 665.
- mixture of wheat bran, gluten feed, and soybean meal, digestibility, 232.
- planted at various dates for supplementary pasture, comparisons, R.I. 326.
- production and quality in Knoxville trade area, Tenn. 330.
- requirements of dairy cattle, lowering, Ohio 880.

Grain(s)—Continued.

small—

- as good grazing crops, N.C. 473.
- best time for planting, Miss. 325.
- diseases in South Dakota, U.S.D.A. 202.
- diseases in Virginia, U.S.D.A. 640.
- for green manure, Utah 186.
- low yields from poor cultural and fertility practices, N.C. 473.
- plat technic studies, 188.
- seed treatments, Spergon and Thio-san for, U.S.D.A. 58.
- value of applying P to, N.C. 473.
- varieties, Miss. 41.
- variously fertilized, comparative yields, Ga. 617.

storage, effect on proteins, U.S.D.A. 723.

stored, insects, Mont. 655.

stored, protection from insects, 654.

Gramicidin—

- d-amino acids in, 583.
- effect on bacteria, 457.
- in vitro and in vivo studies, 815.
- value in herd mastitis control program, 91.

Granary, Russian, North Caucasus as, U.S.D.A. 123.

Grape(s)—

- anthracnose in Chile, 357.
- Arkansas-grown, composition, Ark. 10.
- berry moth control, Pa. 652, Tex. 73.
- berry moth control, spray supplements for, N.Y.State 785.
- California, maturity studies, 54.
- Champanel, performance under different pruning treatments, 197.
- composition and quality, effects of rootstock, Ark. 53.
- control program in Argentina, U.S.D.A. 696.
- diseases, control, N.Y.State 203.
- diseases in Idaho, Idaho 493.
- juice, samples, ascorbic acid in, 418.
- leaf petioles and blades, potassium in, as indicator of potassium, 482.
- leaf petioles, nitrate in, as indicator of nitrogen status of plant, 482.
- leafhopper feeding injury to leaves, effect on photosynthesis, 503.
- leafhopper feeding on apple leaves, effect on photosynthesis and transpiration, 214.
- mealybug (?) on partridge pea, Ga. 655.
- muscadine, breeding results, 627.
- muscadine, diseases, Ga. 640.
- nutrition, Mo. 47.
- Ohanez, pollen-containing sprays for cross-pollination, 635.
- or vine thrips, economic importance and biology, 75.
- Pierce's disease, 343.
- pollen storage, 482.
- poultry manures for, Okla. 763.

Grape(s)—Continued.

pruning and fertilization, N.Y.State 194.
rootworm, biology and control, Ark. 659.
rootworm control, Ark. 72.

varieties—

and rootstocks, incompatibility between, 481.
identification by seed characters, 196.

new tetraploid, breeding, 467.

resistance to freeze of November 1940, 54.

rootstocks for, N.Y.State 194.

variety tests, Ga.Coastal Plain 331.

Grapefruit—

composition and time of maturity, effect of fertilizer practices, 198.

juice, liberal intake, effect, 703.

juices, canned under various processing conditions, ascorbic acid in, 860.

Marsh, yield, quality, and maturity, Ariz. 635.

Grapevines, freeze-injured, methods of handling, Okla. 763.

Grapholitha molesta, see Fruit moth, oriental.

Grass(es)—see also Grassland, Meadows, Pasture(s), etc.

and legumes grown in association, interrelation, 757.

breeding, Mont. 618, Oreg. 619, Tex. 42.

cultivated, in Alaska, 43.

culture tests, Alaska 617.

disease(s)—

host and pathogen indices to, U.S.D.A. 62.

hot-weather, control with chloranil, Pa. 619.

hot-weather, control with Spergon, Pa. 641.

in Wisconsin, U.S.D.A. 640.

endurance on athletic field and airports, R.I. 326.

fertilizer tests, Alaska 617, R.I. 326.

for sheep, nutritive value and digestibility, U.S.D.A. 665.

for winter hardiness, studies, Alaska 617.

growth, improvement by walnut and locust trees, Ohio 326.

insects, Kans. 655.

mixtures, tests, Kans. 618.

n.sp. from North Carolina, 311.

Nebraska, vitamins in, Nebr. 84.

new, grazing tests, Tex. 42.

nutritive value, Ark. 83.

of genus *Echinochloa* of Argentina, 740.

of Mauritius and Rodriguez, 620.

of Nova Scotia, 741.

on South African ranges, carotene in, 232.

pasture, breeding, Ga.Coastal Plain 325, Kans. 618.

pasture, palatability for sheep, Oreg. 666.

pasture, variety tests, Ga.Coastal Plain 825.

prairie, drought resistance of seedlings, 744.

Pythium root rot of, 206.

Grass(es)—Continued.

reestablishment, measures to promote, S.Dak. 186.

reseeding, stand failures in, due to soil-borne parasites, 203.

response to intensity of clipping, Nebr. 42.

seed drying with device employing infrared radiant energy, Pa. 619.

seed, methods of producing, Nebr. 42.

seed production, Oreg. 619.

sickness in horses, causal agent, 529.

silage, see Silage.

species adapted to South Dakota, S.Dak. 186.

stands, effects of time and method of seeding, Kans. 618.

strains, seed production tests, Pa. 619.

strains, tests, Nebr. 41.

superior varieties or strains grown by station, Oreg. 619.

Transvaal dogtooth, promising for lawns, tests, P.R. 619.

tropical American rusts of, revisionary studies, 642.

turf, ecology, 189.

variety tests, Alaska 617, Kans. 618,

Mont. 619, Okla. 755, R.I. 326, Tex. 42.

young, drying for feed, 108.

Grasshopper(s)—

control, Mont. 655.

control, dry bait for, 221.

importance of birds in checking, Utah 653.

problem, 217.

studies, Nebr. 73.

Grassland—see also Grass(es), Meadows, and Pasture(s).

farming, relation to soil and water conservation, 107.

farming, relation to water management, 107.

mesas in Badlands of South Dakota, used and unused, 620.

plants, better, for North Carolina, N.C. 473.

research, N.Dak. 620.

Grazing—see also Range(s).

crops, variety of, N.C. 473.

excess, harmful aspects, N.Dak. 620.

use, estimating, short-cut method, U.S.D.A. 620.

Great Plains, new frontiers of, 393.

Green manure—

crops for soil improvement, Utah 186.

for crops, Tex. 42.

rotation and sequence experiments, Tex. 42.

to replace N fertilizers, value, Ark. 755.

Greenhouse—

beds, fumigation to control symphylids, Pa. 628.

crops, nutrient solution culture, Ind. 763.

soil, chloropicrin for sterilizing, Ohio 831.

Grouse, ruffed, eastern, cover requirements in northeast Iowa, 653.

- Growth substance—*see also* Plant growth substances.
chemical nature, determining, U.S.D.A. 594.
- Guanidine effect on *Nitella*, 606.
- Guanidoacetic acid, dietary, effect on liver lipids of rats, 703.
- Guava(s)—
fresh, canned, and dried, ascorbic acid in, 418.
production, extending, in California, 636.
vitamin C in, 714.
- Guayule—
growing, progress in, Colo. 768.
root knot nematode resistance, U.S.D.A. 640.
rubber from, N.Dak. 624.
rubber, production under irrigation, 637.
- Guinea pig(s)—
adequacy of simplified diets for, 549.
coat color, physiological genetics, 469.
new dietary essentials required by, 705.
ovary, thecal gland in, 324.
- Guineas subjected to all-night light, sexual activity, 377.
- Gymnosporangium, juniper-virginianae*, carotenoids of telial galls of, 216.
- Gypsum excess in soils, calcium- and sulfate-ion concentrations in, 24.
- Gypsy moth control, Conn.[New Haven] 499.
- Haemaphysalis leporis-palustris*, *see* Rabbit tick.
- Haemonchus contortus*—*see also* Stomach worms.
control in sheep, test of anthelmintics for, 682.
- Haemonchus* spp., percentage incidence in cattle, 101.
- Haemoproteus lophortyx* in California valley quail, 251.
- Hair, graying, 570.
- Hair, graying, effect of phenylthiocarbamide ingestion, 412.
- Halatometer, atmospheric, description, 177.
- Halophytes, new perspective in, 601.
- Halticus citri*, *see* Flea hopper, garden.
- Ham(s)—
commercially cured, palatability and cooking losses, effect of constant oven temperatures, Mo. 127.
salt absorption and spoilage, relation to curing temperature and pumping, U.S.D.A. 665.
- Hamsters, newborn, infection by mare-abortion virus, 818.
- Hansenula* on dates, 358.
- Hansenula*, taxonomic study, 601.
- Haploidy, problem of, 466.
- Haplospheeria deformans*, notes, 777.
- Haplosporangium parvum* n.sp., isolation from wild rodents and relation to coccidiodomycosis, 524.
- Harlequin bug—
effect of sulfonated oils combined with cube and derris, 787.
studies, Tex. 78.
- Harvest work, collaboration by United States and Canada, U.S.D.A. 124.
- Hay—
crops, ensiled, palatability and fermentation losses, effect of moisture and acidity, 93.
curing, effect of dew, 758.
handling methods, 256.
handling methods and equipment, changes in, 533.
harvesting methods, newer, Ohio 839.
harvesting methods, newer, survey, Nev. 538.
Michigan-grown, as fed to dairy cattle, composition, Mich. 238.
plants, composition, effect of soils and fertilizers, 20.
production, trends in, 691.
storage, trends in methods, 691.
- Haying practices and machinery, Tenn. 267.
- Heat production of cattle, effect of fasting and refeeding, Mo. 92.
- Hegari stored in trench silos for fattening beef cattle, Tex. 85.
- Heifers—
bred to same sire, artificial v. natural service in, 90.
growth and development on summer pasture and supplementary concentrates, Ga. 671.
growth, digestible nutrient requirements, Vt. 520.
growth rate and milk production, factors affecting, Mo. 92.
raising, war emergency plans for, 811, Ohio 380.
supplements to pasture v. no supplements for, Ga. 666.
weights, oscillatory character of variations in, 808.
yearling, ability to withstand cold temperatures, 90.
- Heligmodendrium hassalli*, parasite of squirrel, 497.
- Heliothis*—
armigera, *see* Bollworm, Corn earworm, and Tomato fruitworm.
virescens, *see* Tobacco budworm.
- Helicula undalis*, *see* Cabbage webworm.
- Helminth(s)—
in lungs and alimentary tract of pig in Queensland, 529.
of poultry in Queensland, 531.
ova in formalinized feces, recovery, method for, 361.
- Helminthosporium*—
blight of sweet corn, N.J. 490.
leaf blight of corn, U.S.D.A. 203.
leaf spot and bacterial wilt on field corn in Indiana, U.S.D.A. 203.
sativum on barley, 486.
turcicum, leaf blight of corn, U.S.D.A. 640.
- Hemicelluloses, feeding value, U.S.D.A. 723.
- Hemispherical scale control, P.R. 656.

- Hemlock, western**—
cultural identification of fungi causing decay in, 780.
white floccose aggregate in wood, characteristics and significance, 780.
- Hemoglobin**—
estimation by alkaline hematin method, 731.
estimation with undiluted reduced blood, 154.
formation, amino acids in, 704.
regeneration in blood donors, rate of, 411.
- Hemoglobinuria**—
a baffling disease of Midwest, 678.
in cattle, Kans. 676.
of calves, in Australia, 528.
studies, Tex. 99.
- Hemometer, Sicca, construction and standardization, 154.**
- Hemophilus**—
gallinarum infection, R.I. 384.
gallinarum, prevention of spread by sulfathiazole, 686.
influenzae suis, synergistic action on chick embryo, 824.
- Hemorrhagic**—
degeneration in young rats, dietary factors affecting, 270.
septicemia, *see* Septicemia.
- Hemp**—
a war crop for Iowa, Iowa 622.
effect of day length on, U.S.D.A. 607.
manila, *see* Abacá.
production, harvesting, and retting practices, U.S.D.A. 617.
- Hen(s)**—
annual egg production, N.J. 802.
broodiness and viability, 88.
fed yeast-fermented mash as supplement to adequate diet, blood values, 88.
laying—*see also* Egg production.
all-mash ration, value of B-Y riboflavin supplement for replacing dried skim milk in, 377.
comparison of corn, milo, and hegari in diet, 236.
fat absorption in, 237.
hegari v. corn for, Tex. 85.
keeping in batteries, Oreg. 666.
pastures and vitamins for, Miss. 231.
pastures for, 377.
poisoned by calcium oxide, 104.
rough rice and no mash v. mash feeding, Tex. 85.
sunlight lamps for, Nebr. 379.
value of green feeds for, Oreg. 666.
male copulatory behavior in, following administration of male hormone, 761.
on normal and low fat rations, absorption and retention of carotene and vitamin A by, 803.
pantothenic acid requirement, 377.
premature expulsion of eggs by, 472.
premature oviposition by, action of vasopressin and oxytocin on, 88.
- Hen(s)—Continued.**
S-4 lamp radiation for, Nebr. 84.
vitamin A deficient, ascorbic acid storage in, 803.
- Hennequen plantings in Haiti, Cuba, and Mexico, U.S.D.A. 617.**
- Hennous confertus, biology, 227.**
- Herbage, composition and yield, effect of fertilizer treatments, Tex. 42.**
- Herbs, tests, Ga. 627.**
- Herd analyses, method of presenting, 807.**
- Herd mastitis control program, value of gramicidin in, 91.**
- Hereditry**—
of plant characters induced by radiation, 608.
of wavy-leaf character in peach, 318.
- Hesperotettix genus in Utah, 221.**
- Hessian fly**—
on wheat, Kans. 655.
studies, Nebr. 73.
- Heterakis**—
gallinae eggs, studies, 815.
gallinae, parasite of partridges, 498.
isolonche in golden pheasant, 251.
- Heterodera rostochiensis**—
cyst population of a field over a series of years, 210.
notes, U.S.D.A. 202.
- Heterosporium echinulatum of carnations in greenhouse, 649.**
- Hevea brasiliensis, crown budding for disease resistance, U.S.D.A. 341.**
- Hexamita sp.**—
and infectious sinusitis in turkeys, Oreg. 676.
from ringed-neck pheasant, 686.
- Hexuronic acids, identification as benzimidazole derivatives, 725.**
- Hibiscus sp., leaf spot induced by *Phytophthora syringae*, 649.**
- Hickory**—
reproduction in Southeast, pests of, 219.
spiral borer, notes, 219.
- Hides and skins, domestic, conserving, U.S.D.A. 723.**
- Histidine, preparation by 3,4-dichlorobenzene-sulfonic acid, 581.**
- Histology, comparative, textbook, 578.**
- Hog cholera**—
control, U.S.D.A. 676.
diagnosis, cell changes in gall bladder as aid in, 245, 814.
immunity, Nebr. 99.
tissue vaccine, immunological studies, 814.
virus isolation from supposedly immune swine, 822.
virus, neutralization by hog cholera antiserum, 103.
- Hogs, *see* Pig(s) and Swine.**
- Holly**—
cut, defoliation in, cause and control, Oreg. 767.
cuttings, defoliation by *Rhizoctonia*, 359.
- Home economics, experiment station research in, effect of war, 126.**

- Homocysteine**—
 dietary, effect on liver lipids of rats, 703.
 synthesis and its replacement of cystine in diet, 581.
- Homogenization studies**, 520.
- Honey**—
 and nectar, pollen grains in, 510.
 effect on calcium retentions in infants, 133.
 marketing by retail grocers, Mich. 269.
 of different localities, vitamin content, 550.
 wine and honey brandy, 296.
- Hop(s)**—
 culture and labor schedule, Oreg. 628.
 diseases in 1941, 775.
 downy and powdery mildews, spraying for, N.Y.State 203.
 downy mildew, spreaders for use with fungicides in spraying for, 66.
 farming in Yakima Valley, Wash. 262.
 gray mold studies, 775.
 leafhoppers and sooty mold on, spraying for, N.Y.State 203.
 varieties, new, test, N.Y.State 332.
 variety tests, N.Y.State 194.
- Hoplocampa testudinea* on Vancouver Is. land, 500.
- Hoplostyllus affinis*, parasite of squirrel, 497.
- Hopvine borer as hop pest, N.Y.State 218.
- Hordeum**—
sativum embryo growth in culture, 29.
 wild species, cytology, 33.
- Horistonotus uhleri*, see Wireworm, sand.
- Hormones**—
 gonadotropic, see Gonadotropic.
 lactogenic and gonadotropic, effects on hypophysectomized pregnant rats, 184.
 lactogenic, bird and rabbit response to, Mo. 34.
 plant, see Plant growth substances.
 thyrotropic, assay, comparison of guinea and chick thyroid in, Mo. 34.
 thyrotropic, in rat pituitary, Mo. 34.
- Horufly**—
 on cattle, acidified nicotine sprays for, 227.
 studies, U.S.D.A. 98.
- Hornia*, systematics of, 659.
- Horse(s)**—
 body fluids of, ascorbic acid in, 103.
 bots and their control, U.S.D.A. 97.
 breeding hygiene, 814.
 breeding, management, and judging, 230.
 diseases and parasites, U.S.D.A. 97.
 draft, feed requirements and selling price, Mich. 235.
 effects of phenothiazine, 530.
 farm, Morgan, work of, U.S.D.A. 800.
 fistulous withers, use of *Brucella abortus* vaccine in, 246.
 insect pests, U.S.D.A. 97.
 nutrition, recent developments in, 800.
 parasites of and treatment for removal, U.S.D.A. 676.
- Horse(s)**—Continued.
 pedigrees in, importance, 750.
 rations for, U.S.D.A. 665.
 Thoroughbred, stakes winning and poor performing, genetic analysis, 610.
 wheat as feed for, Utah 667.
- Horsepower**, farm, efficiency, 513.
- Hosiery**—
 cotton, research, U.S.D.A. 716.
 silk and Nylon, wearing qualities compared, 866.
- Hotbeds**, electric, effect of methods of heating and covering on field production of vegetables, 763.
- Housefly(ies)**—
 as transmitter of *Endamoeba histolytica*, 370.
 central nervous system, effects of pyrethrum and activator on, 81.
 effect of organic halides on, 370.
 recovery from effects of toxicants, effect of temperature, 663.
 relation to transmission of bovine mastitis, 101.
 source of pollution in food establishments, 662.
Tephrosia extract against, 658.
 toxicity of α , β -dibromo- β -nitroethyl benzene to, 782.
 toxicity of paradichlorobenzene to third-instar larvae, 509.
- Household equipment**—
 and housing research, U.S.D.A. 719.
 work, and storage space, 718.
- Houses**, construction, use of preserved wood in, 254.
- Housing**—
 defense, decay of, U.S.D.A. 640.
 low-cost, studies, Ark. 261.
- Howardia biclavia*, see Mining scale.
- Humus** exhaustion in soil and effect on root rots, 204.
- Hyalopterus arundinis*, see Plum aphid, mealy.
- Hybrid vigor**—
 and growth, relation to chromosome degeneration, 407.
 in sheep, 318.
- Hydraulic structures**, scour-control and scour-resistant design for, 449.
- Hydrologic studies**—
 U.S.D.A. 594.
 at Coon Creek Demonstration Project, U.S.D.A. 736.
 at South Fork Palouse River Demonstration Project, U.S.D.A. 736.
- Hydrology**—
 of Sierra Nevada foothills, factors of, 304.
 section, permanent research committees, reports of, 445.
- Hydrometeorology** of San Juan River Basin, Mexico, 445.
- Hydrophobia**, see Rabies.
- Hydroxylysine**—
 dissociation constants, 725.
 in proteins, determination, 587.

Hylemya—*antiqua*, see Onion maggot.*brassicæ*, see Cabbage maggot.*clitorura*, see Seed-corn maggot.*Hyllobius pales*, see Pales weevil.*Hymenomyces*, wood-destroying, longevity of spores, 497.*Hymenoptera*, parasitic—

abortive development due to food plant of insect host, 796.

larval meconium of as sign of species, 72.

Hypenomyia, new genus and key to known species, 227.*Hypera postica*, see Alfalfa weevil.*Hypoderma lineatum*, see Cattle grubs.*Hypophysectomy* at midpregnancy in mouse, effect, 38.*Hypophysis*, see Pituitary(ies).*Hyporylon rubiginosum*, cankers associated with, 496.**Ice cream—**

analyses, Me. 545.

and ice cream mixes, characteristics, Nebr. 95.

bacteriological examination methods compared, 674.

coating fats, supplements to, 675.

coliform group in, 96.

corn sirup solids in, 240.

diabetic, 520.

flavor defects of, evaluation, 96.

flavor scoring, comparative standardization, 814.

frozen cream as source of fat in, Mich. 675.

high serum solids, keeping quality, Mo. 92.

manufacture, saving sugar in, 383.

mix, short-time high-temperature pasteurization, 813.

oxidized flavor in, prevention, 812.

properties, effect of dextrose and sucrose, 382.

properties, effect of forewarming temperatures of condensed skim milk in, 92.

ribbon, new flavors in with fruit purées, 522.

ripple sirups, meeting sugar shortages in preparing, 675.

sandy, lactose crystals in, petrographic microscope for study, Mo. 5.

shrinkage, research on, 520.

stabilizers, role of, and needs for war purposes, 241.

sugars in, 240.

sweetening agents for use in, 520, 814.

sweetness of, U.S.D.A. 671.

technical literature, 240.

texture, structure, and stability in, 92.

Illinois Station notes, 575.

Illinois University notes, 575.

Immigrant, European, in rural Rhode Island, R.I. 405.

Income, relation to farm capital, 393.

1,3-Indandiones, insecticidal properties, effect of acyl groups, 500.

Index numbers of production, prices, and income, Ohio 110, 394, 537.

Indexes of United States and Oklahoma prices, Okla. 261.

Indian-meal moth—

in insect nests, 73.

on milled rice, U.S.D.A. 73.

Indiana Station notes, 427, 575.

Indianwheat, mucklage from, 579.

Infant(s)—see also Children.

effect of honey on calcium retention, 133.

feeding, textbook for students and practitioners of medicine, 410.

newborn, healthy, hematologic standards for, 278.

nutrition, textbook, 410.

premature, ascorbic acid requirement, effect of diet, 560.

Infiltrometer, automatic self-recording, 303.

Influenza—

equine, pathology, 823.

virus group, affinity of Newcastle disease virus to, 242.

Inositol synthesis in mice, 703.

Insect(s)—see also Entomology.

and other arthropods in buildings in British Columbia, 500.

and pests in stored products, 500.

apparatus for obtaining interval collections, 498.

attractants and repellents for, 219.

attracted to felled elm trees, isolation of *Ceratostomella ulmi* from, 784.

blood, pH of, and bearing on in vitro cytological technic, 656.

control and pest survey, Okla. 783.

control by aircraft, 657.

control, fluorine compounds for, Tenn. 785.

control in Hawaii, 218.

control in home vegetable garden, N.J. 784.

damage, forest, use of frass in identification, 502.

eastern oceanic, distribution and origin, 362.

eggs, penetration of oils into, N.H. 220.

entomophagous, measurement of effect on population densities of hosts, 783.

food caches as reservoirs and sources of stored products pests, 73.

forest, see Forest.

hosts of *Beauveria bassiana* on elm in United States, 650.

household and storage grain, effect of high temperature, 783.

immature, killing and preserving fluid for, 499.

in Canada, biological control, 657.

industrial fumigation against, U.S.D.A. 221.

infesting dried fruits, control, 784.

injurious, biological control, N.Y.State 218.

injurious to crops, see special crops.

integument of, relation to entry of contact insecticides, 363.

Insect(s)—Continued.

- internal effects of dinitrophenols on, 220.
- metabolism, relative effects of constant and varied temperature sources, 409.
- mounting, block method, 72.
- natural control, N.Y.State 785.
- night-flying, kinds of light attracting, 219.
- of Brasil, 783.
- of Guam, 218.
- of North Carolina, supplement, 655.
- of stored products, nests of bees and wasps as sources, 73.
- on nursery stock, N.Y.State 218.
- orchard, *see* Orchard insects and Fruit insect.
- pests of nursery stock, Oreg. 655.
- pests, periodical recurrence, Mo. 72.
- pH values of alimentary canal, 782.
- populations, fluctuations in, 370.
- populations of Kansas, summary, 499.
- preparation and preservation, 498.
- rearing box with electric barriers, 361.
- relations to man, textbook, 361.
- response to color, intensity, and distribution of light, 219.
- scale, *see* Scale insect(s).
- separation methods, applications to entomology, 656.
- spray, all-purpose, 220.
- storage, studies, 218.
- stored grain, toxicity of ethide to, 782.
- temporary establishment on Canton Island, 73.
- wood-boring, notes, 654.
- Insecticidal dusts and diluents, deposits on charged plates, 786.
- Insecticides—*see also* Spray(s) and specific forms.
 - added to soils, effect on growth and yield of plants, 501.
 - chemistry of, 657.
 - coal tar products for, Pa. 652.
 - concentrated nicotine dust mixed with, 500.
 - contact, studies, N.H. 220.
 - determining effectiveness, 364.
 - efficiency, relation to particle size, 657.
 - nonpoisonous, N.Y.State 149.
 - properties, physical and chemical, analysis and evaluation, N.Y.State 149.
 - recent advances in, 657.
 - requirements of California crops, 782.
 - reversals in order of effectiveness, 782.
 - role in war program, 657.
 - rotenone-containing, relative effectiveness, 786.
 - studies, Mo. 72, N.Y.State 218.
 - synthetic organic compounds as, 500.
- Insemination, artificial—
 - of cattle and transportation of semen, Ga. 611.
 - of commercial dairy cows, economic aspects, 394.
 - of dairy cows, Mo. 34, Vt. 520.
 - of farm animals, Minn. 184.
 - of poultry, Kans. 666.

Insemination, artificial—Continued.

- of sheep, with fresh and stored semen, 324.
- present-day technics, 90.
- schedule, 811.
- semen storage for, relation of fundamentals of sperm metabolism to problem, 610.
- use of dilutor for jack and stallion semen, 614.
- Insulin, treatment with dilute alkali, formation of lanthionine by, 581.
- Insurance, Federal crop, value, 536.
- Intestinal contents, pH of, relation to calcium and phosphorus, 550.
- Invertase activity from -70° to 50° C., kinetics as function of temperature of, 289.
- Iodine, determination in soluble iodides and in organic compounds, 587.
- Ions, essential, in culture solutions, effect on plant growth in sand containing permittite and aniline black, R.I. 301.
- Iridomyrmex humilis*, *see* Ants, Argentine.
- Iris, bearded, in Texas, adaptability studies, Tex. 199.
- Iris borer killed by insecticide, Ohio 362.
- Iron—
 - buried, rate of corrosion, relation to oxygen supply of soil, 451.
 - colorimetric microdetermination of, 433.
 - oxides, free, removal from soils and colloidal clays, 164.
 - requirements of children, 411.
 - salts, effect when used at enrichment level in flour, 151.
- Irrigation—
 - new device to indicate need of, Ohio 301.
 - payments, feasible, method of determining, 393.
 - pump, Nebr. 105.
 - studies, Mont. 688.
 - water forecasting in Upper Columbia drainage basin, 299.
 - water forecasts and snow surveys for—
 - Colorado River Drainage Basin, Colo. 736, U.S.D.A. 736.
 - Missouri and Arkansas Drainage Basins, Colo. 736, U.S.D.A. 736.
 - Oregon, Oreg. 736, U.S.D.A. 736.
 - Rio Grande Drainage Basin, Colo. 736, U.S.D.A. 736.
 - water, silty, effect on crops and soils, 596.
 - water supply system capacities, 252.
- Itch mite—
 - parasite of squirrel, 498.
 - survival and behavior, 665.
- Ixodes*
 - baergi* n.sp., parasitic on cliff swallow, 664.
 - dentatus* from Iowa, 498.
 - holocyclus*, biology, toxicity, and breeding, 512.
 - holocyclus*, transmission of Q fever by, 525.
 - soridis* n.sp. on shrews, 230.
 - spinipalpis*, notes, 512.

- Ixodoidea in Iowa, 230.**
- Japanese beetle—**
 control in Indiana, 227.
 immature states, ethylene dichloride for control, 782.
 in New York State, N.Y. State 227.
 milky disease for natural control, N.Y. State 785.
 milky disease of, organisms causing co-operative distribution, 504.
 quarantine enforcement, Conn. [New Haven] 499.
 sprays for, tests, 782.
- Jaundice, toxic, of sheep in Australia due to disturbance of copper metabolism, 528.**
- Jerusalem-artichokes—**
 fermentation by butyl acetone organism, 431.
 variety tests, Nebr. 41.
- Jimmies in sheep and goats, Tex. 99.**
- Jimsonweed, drug plant chemistry of, P R 579.**
- John's disease—**
 arteriosclerosis in case of, 243.
 in Arkansas, Ark. 100.
 in farm animals, 678.
 reactions to johnin in sensitized guinea pigs, 817.
 studies, U.S.D.A. 97, 676.
- Jujube variety tests, Ga. Coastal Plain 331.**
- Juniper midge studies, Kans. 655.**
- Juniperus scopulorum* seed, changes in, during processes of afterripening and germination, 342.**
- Jute fibers, substitutes for, 866.**
- Kalanchoe, Michigan State, new hybrid, description, Mich. 199.**
- Kalotermea (Cryptotermea) brevis*, control, P.R. 656.**
- Kansas College notes, 428, 721, 868.**
- Kansas Station notes, 428, 721, 868.**
- Kansas Station publications available, 867.**
- Kansas Station report, 719.**
- Kentucky Station notes, 428.**
- Kentucky University notes, 428.**
- Keratitis in cattle, treatment, 244, Tex. 99.**
- Ketosis in dairy cattle, 672.**
- Ketosteroids, 17-, neutral urinary, colorimetric assay, elimination of errors in, 589**
- Kidney—**
 bovine, histology, 100.
 pulpy, disease, Oreg. 676.
- Kitchen waste, agronomic value, 308.**
- Kudzu—**
 flowering in, factors affecting, 186.
 seed production, 622.
 seedlings, response to cultural and environmental factors, 760.
 use in rotation system, 184.
- Labor—see also Farm labor.**
 crisis in coming year, mistakes to be avoided in, Colo. 844.
- Laboratory (ies)—**
 commercial testing and college research, directory, 284.
 regional research, U.S.D.A. 723.
 technic, approved treatise, 383.
- Lachnea, guide to phylogeny, 658.**
- Lactation—**
 and reproduction, effectiveness of linoleic, arachidonic, and linolenic acids in, 859.
 dietary requirements for, 420, Ark. 284.
 in goats, effect of stilboestrol and anterior pituitary extract, 673.
 initiation at parturition, cause of, 90.
 initiation, at parturition, mechanism controlling, 470.
 initiation, effect of adrenalectomy on, 91, 754.
 of dairy cows, repeatability of various portions and value as indicators of permanent productivity, 807.
 period, predicting fat test for, on basis of incomplete record, 519.
 relation to nutrition, 131.
 role of inositol and *p*-aminobenzoic acid in, 673.
 studies with dairy cows, method of equalized feeding for, 519.
- Lactic acid—**
 bacteria, eluate factor required by, purification and properties, 175.
 bacteria, glutamine and glutamic acid as growth factors for, 728.
 bacteria, heat resistance, effect of film yeast, 96.
 characterization as benzimidazole derivative, 725.
 lacquers, development, U.S.D.A. 671.
- Lactobacillus—***
bulgaricus, growth at low temperature, effect on heat resistance, 380.
casei eluate fraction, effect on reproduction in poultry, 802.
casei, pyridoxine nutrition of, 458.
casei, substance in blood stimulatory for, concentration of, 412.
casei, supplementary growth factor for, 417.
- Lactogen—**
 content of pituitary of albino mice compared to other species, 471.
 in adrenal glands, assay, 754.
 in pituitary and blood of male rabbits, effect of oestrone, 753.
 in pituitary of ovariectomized rats, effect of progesterone, 753.
- Lactogenic hormone—**
 effect of adrenalectomy on, 754.
 effect on time during which deciduomata may be induced in lactating rats, 754.
- Lactose—**
 crystals in sandy ice cream, petrographic microscope for study, Mo. 5.
 in milk, polarimetric determination, Mo. 5.
- Lactuca* species, amphidiploids in, 179.**
- Laetius* sp., parasite of carpet beetle, 500.**
- Laemophloeus minutus*, see Grain beetle, flat.**
- Lagenidium muenscheri* n.sp. parasitic on *Potamogeton*, 781.**
- Lakes, evaporation from, 736.**

Lamb(s)—

- body measurements and carcass value, relation to growth rate, Mich. 608.
- carcasses, grade, relation to separable fat, U.S.D.A. 665.
- fat, production, grain concentrates and pasture for, Okla. 797.
- fattening, alfalfa v. ground quadron stover and heads for, Tex. 85.
- fattening, evaluating feeds for, 514.
- fattening, feeding methods and rations, Minn. 799.
- fattening, linseed meal v. cottonseed meal for, Tex. 85.
- fattening ration, effect of large amounts of cottonseed meal in, 515.
- feed for, Nebr. 84.
- feed lot, sorting chutes, panels, and hay self-feeders for, Colo. 834.
- feeding with home-grown grains, Mont. 666.
- goiter in, prevention with iodized salt, Mont. 676.
- grain supplements for, Mont. 666.
- Karakul, fur characters, 513.
- linseed meal v. cottonseed meal for, Tex. 85.
- liver catalase, crystalline, 728.
- losses, preventing, Mich. 683.
- nitrogen balance experiments, effect of feeding low-nitrogen rations, 515.
- nutritive value, conservation of, Utah 720.
- production, increasing after the war, 796.
- resistance to stomach worms, Tex. 35.
- spring, production experiments, 797.
- spring, seasonal prices on auction markets, Ky. 540.
- spring, yield and carcass grade, effect of fasting, 514.
- stiff, disease, Oreg. 676.
- storage temperature and tenderness, U.S.D.A. 665.
- western, fattening, value of various rations for, Ind. 799.
- western, feeding, 234.
- wheat bran, corn, and soybeans for, Pa. 666.

Land(s)—see also Farm land(s).

- abandoned cultivated, returning to grazing, Colo. 756.
- acquisition program under Title III of Bankhead-Jones Farm Tenant Act, U.S.D.A. 266.
- classification, Mo. 15.
- classification and valuation for assessment purposes, Mont. 399.
- conditions in Chariton Co., Mo., U.S.D.A. 737.
- credit, see Agricultural credit.
- Federal, conservation expenditures on, 393.
- for recreational use, zoning, 125.
- government purchase, social effects due to construction of Sardis Dam and Reservoir, Miss. 537.

Land(s)—Continued.

- hard, areas, range studies in, Nebr. 42.
- irrigated farm, system of economic classification, Utah 595.
- ownership and operating tenure in Imperial Valley, Calif. U.S.D.A. 840.
- rented, landlord supervision of operation, Tex. 111.
- settlement of Russian-Germans in the Dakota Territory, 843.
- tenure and related problems, Kans. 693.
- tenure in Yazoo-Mississippi Delta, Miss. 537.
- tenure policies at home and abroad, 265.
- uncultivated, in western United States, use, 536.
- use and related changes in Knott Co., trends in, Ky. 537.
- use and rural living on urban margin, R.I. 405.
- use areas, estimating from aerial photograph index sheets, 202.
- use experience in Callaway Co., Mo. 112.
- use in Schuyler Co., economic study, [N.Y.]Cornell 262.
- use in towns in Arrostook Co. Me. 398.
- use, recreational, economic aspects, Mo. 113.
- use relation to sedimentation in reservoirs in Trinity River Basin, Tex. 106.
- use, rural, outstanding Federal and State laws affecting, U.S.D.A. 840.
- values, U.S.D.A. 270.
- values and transfers in North Dakota, N.Dak. 394.
- values, keeping track of, through periodic surveys, U.S.D.A. 835.
- landlord-tenant relation, legal aspects, Ohio 394.
- Langstroth, life of, 795.
- Lanthionine—
 - formation on treatment of insulin with dilute alkali, 581.
 - dl, isolation from various alkali-treated proteins, 725.
- Laphygma frugiperda*, see Armyworm, fall.
- Larch—
 - mycorrhizal relations, 176.
 - shoot moth, biology and natural control, 659.
- Lard, melting point, effect of wheat and corn in, Oreg. 666.
- Larkspurs, annual, viroses of, Calif. 779.
- Laryngotracheitis—
 - and pox, failures in immunization against, cause, 814.
 - infectious, diagnosis and control, 100.
 - infectious, in chickens, Oreg. 676.
- Latrodectus indistinctus*, insect food and hymenopterous parasites of, 512.
- laundrying tasks, home, relation to worker and equipment, 718.
- Laundry processes, home and commercial, efficiencies, 425.
- Lawgrass, Japanese, *Claviceps yanagawaensis* in imported seed of, 62.

Lead arsenate—

basic, stability with spray ingredients, 782.

substitutes for, Mo. 47.

Lead-cable borer, attack on asphalt roofing material, 72.

Lead determinations with dithizone, factors affecting, 6.

Leaf(ves)—

carotene, determination, method, 8.

crumpler, studies, Tex. 73.

green, chlorophyll-protein compound, 172.

stomatal movements, theory of porometers used in study, 30.

Leafhoppers—*see also special hosts.*

control, Tex. 73.

feeding injury to leaves, effect on photosynthesis, 503.

of genus *Empoasca*, trap-light studies, 75.

redbud, studies, Kans. 655.

six-spotted, protecting plants against, 222.

Lease renewal, automatic, Iowa statutory provisions for, 394.

Legume(s)—*see also* Green manure and Alfalfa, Clover, etc.

and grasses grown in association, interrelation, 757.

boron fertilization, 758.

breeding, Oreg. 619.

bugs in seed alfalfa, insecticidal control, 365.

cost of seeding and yields, Mo. 110.

crops, variation of lime requirements, Pa. 595.

culture tests, Alaska 617.

diseases, U.S.D.A. 58.

effect on soils and crops, Miss. 597.

fertilizer tests, Alaska 617, Miss. 186, 326.

for winter hardiness, studies, Alaska 617.

hays, value in rations of fall farrowed pigs, 513.

in Alaska, 43.

inoculant inspection, N.Y.State 159.

inoculant tests, N.Y.State 762.

interplanted with oats for hay, Tex. 42.

nitrogen fixation in soils by, Mo. 15.

nodules, excised, N fixation experiments, 461.

nutritive value, Ark. 83.

palatability for sheep, Oreg. 666.

roots, excretions of nitrogen compounds from, 457.

roots, loss of nodules from, significance, 621.

seed production tests, Pa. 619.

silage, ground corn as preservative, Ohio 380.

v. corn for fattening calves, Mich. 233.

value for maintaining soil fertility, Miss. 300.

variety tests, Alaska 617, Kans. 618, Tex. 42.

Legume(s)—Continued.**winter—**

culture tests, Tex. 42.

fertilization, early seeding, and drainage important, Miss. 325.

fertilizer tests, Tex. 42.

for green manure in Cotton Belt, U.S.D.A. 43.

for soil improvement, Ark. 40.

growth, effect of acid-forming fertilizer not supplemented with limestone, 185.

increasing to meet nitrogen shortage, Miss. 41.

inoculation for, Miss. 325.

varieties and kinds, Miss. 41.

woody desert, behavior at wilting percentage of soil, 30.

Lemon grass—

distillation residues, analyses, P.R. 579.

essential oils from, studies, P.R. 579.

Lemon juice, effect on calcium retention, 277.

Leotil, a sorghum for starch, Nebr. 475.

Lepidoptera of Mexico, systematic and zoogeographic catalog, 508.

Lepidopterous—

larvae, host plants and parasites, 661.

pests of corn in Trinidad, 661.

pests on fruit trees and their parasites in Ireland, 661.

Lepidosaphes beekii, *see* Purple scale.

Leptinotarsa deccimlineata, *see* Potato beetle, Colorado.

Leptosphaeria spp., new and interesting from Mt. Shasta, 601.

Leptospirosis among dogs in Honolulu, 530.

Lespedeza—

annual, for Florida pastures, Fla. 329.

as crop to precede grasses on poor land, N.C. 473.

biological value for dairy helpers, 90.

diseases, Ga. 640.

fertilizer tests, Miss. 186.

in Coastal Plain area, 761.

increased yields by lime and phosphate, N.C. 446.

Korean, seed, as protein supplement for milk production, Mo. 380.

Korean, seed, feeding for milk production, 90.

nutrients in, effect of soil fertility, Ind. 737.

photoperiod effects on, Mo. 25.

protein and mineral content, Ga. 579.

variety tests, Miss. 186.

Lespedeza sericea, *see* Sericea.

Lettuce—

cos or romaine, response to chloropicrin soil treatment, phosphate, and lime, 308.

cultural tests, Ga.Coastal Plain 331.

damping-off control, N.C. 485.

disease symptoms caused by bean leafhopper, 646.

fertilizer tests, Ga.Coastal Plain 331.

Lettuce—Continued.

growth and yield, effects of partial defoliation at transplanting time, U.S.D.A. 47.

head, culture, P.R. 629.

head, Great Lakes, new variety adapted to summer conditions, Mich. 764.

iceberg, spacing and fertilizer studies, 192.

interspecific genetic relations in, 749.

nutrient absorption by, in Salinas Valley, California, 764.

on Everglades muck, effect of starter solutions, 191.

production in Mississippi, Miss. 332.

quality, production under Mississippi conditions, Miss. 49.

seed treatment, Miss. 354.

seed, viability, [N.Y.]Cornell 192.

tests, Ga. 627.

value of molybdenum for, 48.

varieties, breeding, U.S.D.A. 627.

varieties for greenhouse culture, development, Ohio 331.

Leucosis—

avian, complex, U.S.D.A. 676.

avian, complex, serological studies on, 825.

avian, complex, vinylite-resin corrosion preparations in study, 104.

avian, in embryos, interspecies transmission, 104.

fowl, production of specific antibodies against the agent, 686.

fowl, studies, Mo. 99.

Leukemia—

in animals, spontaneous and experimental, 523.

lymphogenous, Kans. 676.

transmissible chicken, test of greenmilk for, 825.

Leukopenia in rats, prevention and treatment, 526.

Lice—

and other parasites of domestic animals, 502.

head and body, new methods of control, 654.

of pigs, U.S.D.A. 98.

on native American rodents, host distribution, 865.

poultry, sulfur for control, Fla. 250.

Ligustrum vulgare, olives grafted on, behavior, 316.

Liliaceae, virus disease in Portugal, 495.

Lily (ies)—

bulb rot diseases, 495.

culture, suggestions for beginner, 637.

Easter, growth and flowering, effect of bulb treatments, Mich. 637.

insect pests, 656.

Lima beans, *see* Beans, lima.

Lime—

and phosphorus as primary soil needs, Pa. 595.

downward movement in soils, N.C. 446.

Lime—Continued.

importance in feedlot ration, in sanitation, and in treatment of manure, Colo. 867.

products, inspection, Mass. 739.

Limestone—

dolomitic, effect on soils and crops when used in complete fertilizers, 454.

finely ground, for agricultural use, Mo. 15.

Liming—

experiments, 598.

relation to efficiency of fertilizers, 454. the land, N.J. 168.

various soils and crops, effect, Miss. 597.

Limoniis—

agonus, *see* Wireworm, eastern field.

californicus, *see* Wireworm, sugar beet.

canus, *see* Wireworm, Pacific coast.

Linen in part linen fabrics, quantitative analysis, 803.

Linkage relationships of mendelian factors in beans, 34.

Linseed meal, old-process v. solvent-process, as supplement for fattening calves, Nebr. 84.

Lipase—

activity from -70° to 50° C., kinetics as function of temperature of, 289.

in milk, role in development of rancidity, 239.

Listerellosis in a goat, 390.

Listeria infection, histopathological changes in ophthalmic response of animals to, 678.

Listroderes obliquus, *see* Vegetable weevil.

Litmus, standardization, progress in, 607.

Live oak mildew disease control, 359.

Liver—

abscesses in feed lot cattle, U.S.D.A. 676.

chemical analyses, relation to its vitamin A potency, 731.

concentrate as source of unrecognized vitamins required by chicks, 379.

fat of rats, effect of dietary factors, 703.

flake in cattle, sheep, and goats, Oreg. 676.

Livestock—see also Animal(s), Mammals, Cattle, Sheep, *etc.*

and forestry enterprises on farms in Ozark region, Ark. 115.

and livestock products, marketing, Kans. 693.

artificial insemination of, Minn. 184.

breeding and insemination, Ga. 611.

closed herds, effect of progeny testing on progress from selection within, 610.

diseases, *see* Animal disease(s) and *specific kinds*.

feeding and management, problems in, Miss. 230.

feeding, fluorine problem in, 514.

feeding, use of wheat for, Wyo. 373.

general science of, 372.

Livestock—Continued.

- grazing on wild land and cut-over land, Mich. 667.
 industry in Southeast, appraisal, Ala. 114.
 industry, relation to native vegetation, Tex. 25.
 keeping healthy, U.S.D.A. 97.
 management, 272, 372, Kans. 618.
 market classes and grades, U.S.D.A. 403.
 marketing practices, S.Dak. 208.
 movement at Kentucky auction markets, Ky. 539.
 nutrition problems, physiological approach, 231.
 parasites and insects affecting, U.S.D.A. 97.
 physiological and genetic studies by Bureau of Animal Industry, U.S.D.A. 611.
 poisoning, *see* Plants, poisonous, and specific plants.
 production—
 experiments, Ohio 373.
 treatise, 230.
 wartime, improving range conditions for, U.S.D.A. 620.
 raising in U. S. 1607-1860, history, U.S.D.A. 839.
 rations, computing, direct methods, 231.
 relation between body weight, amount of wool or feathers, and temperature, Mo. 84.
 seasonal rhythms in, Mo. 34.
 statistics, *see* Agricultural statistics.
 transportation and processing problems, U.S.D.A. 694.
 vitamin A and carotene requirements, 798.
 vitamins for, Mo. 514.
 Living, standard of, *see* Standard.
 Lizard(s)—
 brown-shouldered, seasonal insect food of, 783.
 range, as insect predators, 362.
Lobelia cardinalis seed, microsporogenesis and development, 465.
 Loco weed poisoning, Tex. 99.
 Locust(s) (insect)—
 brown, incipient outbreaks, forecasts, 658.
 grouse, genetics, 612.
 grouse, inheritance of, Kans. 655.
 in South Africa, acarine parasites infesting, 658.
 Locust (tree), honey, *Thyronectria austro-americanana* disease of, U.S.D.A. 58.
 Loess deposits, variations in properties and distribution, Ill. 16.
 Log and stumpage prices for 1939 and 1940, U.S.D.A. 58.
 Loganberry dwarf disease, Oreg. 641.
Lonchocarpus nicou, culture and physiology of, P.R. 629.
Lophodermium spp., new and interesting from Mt. Shasta, 601.
 Louisiana Station notes, 868.
Lowostoge sticticalis, *see* Webworm, beet.

Lucilia—

- palleascens* as transmitter of *Endamoeba histolytica*, 370.
 spp., seasonal distribution, 81.
 Lumber—*see also* Timber and Wood.
 hardwood, supplies, Ark. 768.
 pressure-treated, fireproofing standards for, 255.
 requirements on farm, U.S.D.A. 830.
 Lung lobation in mice, factors affecting, 86.
 Lungworms—
 in sheep and goat, phenothiazine for control, 821.
 of domestic and bighorn sheep in Wyoming, Wyo. 245.
 studies, Oreg. 676.
 Lupine diseases, Ga. 640.
Lupinus albus growth, effect of sulfanilamide and derivatives, 606.
 Lygus—
 bugs in seed alfalfa, insecticidal tests for, 787.
 hesperus studies, Tex. 73.
 injury to alfalfa plants, 362.
 on cotton, control by dusts, 504.
 pratensis oblongatus, *see* Tarnished plant bug.
 spp. on potatoes, Nebr. 73.
 Lymph nodes in male rats, effect of thyroidectomy, castration, and replacement therapy, 755.
 Lymphomatosis-osteopetrosis in chickens, serial passage of, 104.
 Lymphomatosis studies, Kans. 676.
 Lysimeter studies, 18.
 Macadamia seeds, chemical constituents, relation to chlorosis in seedlings, 630.
 Machinery, *see* Agricultural machinery.
 Mackerel—
 bacterial flora, effect of fast-freezing, 849.
 oil, vitamins A and D potency, 706.
Macronoctua onusta, *see* Iris borer.
 Macrosiphum—
 pisi, *see* Pea aphid.
 sonchi on orange-glowvine, P.R. 656.
Macrosteles divinus, *see* Leafhopper, six-spotted.
 Magnesium—
 arsenate, determination in treated wood, 154.
 available, determination, laboratory method, R.I. 301.
 Maine Station notes, 575.
 Malaria—*see also* Mosquito(es) and *Anopheles*.
 avian, and chemotherapy, 248.
 avian, parasites, preservation by low-temperature freezing, 248.
 in man, microscopical diagnosis, manual, 662.
 Malnutrition, prevalence of, 565.
 Malt tonic, vitamin B complex in, 856.
 Mammals, breeding season in, after transference to new latitude, 38.

Mammary—

and teat development, experimental, in goat, 470.

development, mammogen control of, 90.

gland—

fat metabolism of, effect of ketosis, 672.

growth in hypophysectomized castrated guinea pigs, 754.

of ovariectomized rats, effect of progesterone, 753.

oxygen uptake and CO₂ elimination, 91.

structure in rat, relation to thyroid, 616.

tissue, bovine, lipolytic activity, 807.

tissue, enzymatic hydrolysis of diacetin by, 91.

growth in male mice fed desiccated thyroid, 321.

involution in mice, 324.

lobule-alveolar growth—

effect of thyroxine, 471.

stimulation by progesterone-like activity of steroid compounds and of diethylstilboestrol, 471.

stimulation, effect of thyroxine, 91.

system, effect of selection of nipples by suckling rats, 471.

Man (men)—

and animals, bacterial infections and parasites common to, U.S.D.A. 97.

healthy, hematologic values for, 548.

swine erysipelas infection in, Nebr. 242.

Manganese—

absorption and excretion by man, 279.

active, in soil, determination, 452.

content of commercial matches, Mass.

798.

deficiency in rat, 278.

deficiency, lime-induced, production on eroded Kentucky soil, 598.

effect on calcification in rat, 277.

for oats and white beans in Michigan, 168.

Mango—

of dogs, U.S.D.A., 98.

of equines, U.S.D.A., 97.

of swine, U.S.D.A. 98.

Mangels—

fertilizer tests, R.I. 326.

vitamin B deficiency in, R.I. 326.

Mango, polyembryony in, P.R. 629.

Mangosteen cultivation, 25.

Manila—

fibers, substitutes for, 866.

hemp, *see* Abacá.

Manure—

artificial, preparation and use, Mass. 165.

conserving fertilizer value, effect of amendments in, Vt. 447.

Maple(s)—

bleeding canker, response to chemotherapy and fertilization, R.I. 344.

Japanese, identification, 601.

products research, N.Y.State 149.

Maple(s)—Continued.

trees, sugar, effect of location and character on sugar in sap of, 638.

trees, vegetative propagation and sex, 342.

Mare(s)—

natural breeding and artificial insemination, Miss. 230.

oestrous cycle conditions, relation to oestrin of follicular fluid in urine, Mo. 34.

oestrus and ovulation in, 615, Mo. 34.

ovulation in, induction of, Mo. 34.

Marietta spp., effect of dormant sprays on, 510.

Market, French, in New Orleans, operating practices on farmers' section, La. 122.

Market gardens, *see* Truck crop(s).

Market reports, U.S.D.A. 124, 540.

Marketing—*see also* special products.

of farm products, wartime, U.S.D.A. 841.

problems, wartime, Ark. 841.

Marten, fur quality and greater prolificacy,

effects of feeding, Alaska 652.

Massachusetts College notes, 568.

Massachusetts Station notes, 288, 568.

Mastitis—

and herd practices at Michigan State College, 91.

and the udder, 682.

as important dairymen's problem, N.C. 520.

control, lactovaccine in, 91.

germs, shedding by apparently normal cows, Ohio 383.

in cattle, virus as cause, attempt to demonstrate, 527.

streptococci—

control by segregation program, [Conn.] Storrs 819.

effect of injections of Novoxil in udder, 820.

tyrothricin in treatment, results, 102, 682.

value of udder infusion in treatment, 820.

studies, Kans. 676, Tex. 99, U.S.D.A. 97, 676.

sulfanilamide administered directly into mammary gland for, 101.

sulfanilamide in iodized mineral oil for, preparation, 819.

treatment, role of gramicidin in, 244.

treatment with homogenized oil-sulfanilamide, 244, 681.

Mathematics in agriculture, 272.

Matsucoccus bisetosus on ponderosa and Jeffrey pines, seasonal history, 224.

May beetles, wingless, Tex. 73.

Maydeae tribe, proposed taxonomic change in, 741.

Meadows—*see also* Hay, Grass(es), Grassland, and Pasture(s).

improvement, Nebr. 41.

mountain, proper use, U.S.D.A. 327.

Mealybug—

apple, and its allies in northeastern America, 223.

apple, control by dormant sprays, 223.

coconut, parasite of, P.R. 655.

problem and orchard mites, 230.

sugarcane, experiments with, 658.

Measures and weights in United States, inspection and control, U.S.D.A. 401.

Meat—*see also* Beef, Lamb, Pork, etc.

and human health, 281.

and milk hygiene, report of committee on, 814.

animals, wartime marketing problems of, Ark. 841.

canned, processing, Tex. 127.

canning methods, Calif. 409.

cooking problems, contributions of applied research to, 272.

dehydration on production basis, 439.

freezing preservation, N.Y.State 272.

home canning, U.S.D.A. 129.

in nutrition, 273.

meal and soybean meal mixture, gross values, 236.

meal, nutritive value, 231.

microbiology, 846.

nicotinic acid in, 858.

pantothenic acid in, effect of enzymatic digestion on, 153.

phenols in, estimation, 589.

plants, small, developing dehydrating method for, 440.

preparation of muscular tissues for histological study, 514.

preservation studies, U.S.D.A. 700.

products in feeding program, 374.

smoked, studies, 516.

supply program of 1943, Mich. 707.

tendering during cooking, factors responsible for, Tex. 127.

Medicago spp., composition of pods and seeds, 797.

Medicinal plants, *see* Drug plants.

Mediterranean fever, *see* Undulant fever.

Melampsorella distribution patterns in national forests and parks of West, 649.

Melissopus latiferreanus, *see* Filbert worm.

Melon fly, feeding preference, laboratory method for evaluating, 795.

Melon pests, studies, 218.

Melons, growing and handling, Calif. 49.

Mending—

men's suits, U.S.D.A. 867.

pointers and directions concerning, U.S.D.A. 718.

Meningoencephalitis, canine, Kans. 676.

Mercury fungicides, substitutes for, 206.

Meringues, soft, quality, factors affecting, 699.

Mesolanthionine, isolation from various alkali-treated proteins, 724.

Mesquite control, Tex. 42.

Metabolism, basal, effect of operator on variability of data, 549.

Metagonistylum minense, liberations and shipments to Louisiana, P.R. 655.

Metals, extraction from aqueous solutions, 6.

Metaphosphate, use in nutrient solutions, 632.

Metaphycus helvolus, encyrtid parasite of black scale, 511.

Metasphaeria spp., new and interesting from Mt. Shasta, 601.

Meteorological—

data, N.Y.State 160.

observations, 14, 209, 593. Ga.Coastal Plain 299, Mass. 594, R.I. 299.

report, annual, Alaska, 594.

Meteorology—*see also* Climate(s), Rainfall,

Temperature, Weather, etc.

agricultural, in Canada, 159.

in Guatemala, studies, 159.

introduction to, 126.

papers on, 736.

Methionine, relation to choline requirement of rats, 279.

Mice—*see also* Rodent(s).

and their F_1 hybrid, inbred lines, spleen transplantation relations, 749.

anophthalmic strain, results of crosses with other strains, 319.

cross of two inbred strains, skeletal difference between reciprocal F_1 hybrids from, 749.

differences in social organization, 750.

effect of crystalline thyroxin on growth rate, food intake, and body composition, 321.

genic effects of coat color in, 749.

hypophysectomized at midpregnancy, effect, 38.

mutations with similar effects in, close linkage between, 182.

new coat color dilution in, 750.

new mutation in, affecting spinal column, 36.

new recessive mutation, marcelled, affecting the coat, 750.

oogenesis in, 38.

resistance to loim disease and other pathogens, Tex. 35.

Silver dwarf, growth, effect of injections of anterior pituitary extracts, 183.

spotting patterns, analysis of minor spotting genes, 36.

with different amounts of white, artificial selection in, 469.

Michigan College notes, 575.

Michigan Station notes, 575.

Microbiology—

and man, 815.

industrial, treatise, 578.

Microdracon—

hebeter, biology of, 361.

methods of rearing, 361.

parasites, methods of rearing, 654.

Microchaetina, new genus and key to known species, 227.

Micrococci, respiratory studies, 177.

Micromelia, inherited, in poultry, 613.

Micromonospora in inland lakes, 310.

Micro-organism(s)—*see also* Bacteria.

and vitamins, 413.

control by ultraviolet irradiation, 106.

relative inhibition by glucose and sucrose sirups, 459.

substances of, selective antibiotic action, 459.

types, in soil, air, and feeds, methods of identifying, N.Y.State 159.

Microscopic slides, device for marking fields on, 361.

Midge, Klamath, biology, 500.

Miersia chilensis macrogametophyte development, 465.

Mildew(s)—*see also* Host plants.

cause and requirements for mildew-proofing agents, 864.

micro-organism on cotton, oxygen absorption and catalase production during growth, 424.

powdery, protoplasmic continuity in, 642.

Milk—

abnormal flavors in, Mont. 671.

analyses, Me. 545.

and fat production, effect of—

continuous injection of pitocin, 91.

dietary fat and fat-soluble vitamins, 519.

oxytocin, 809.

thyroxin, Mo. 34.

and milk products, still-unidentified nutrients in, 90.

and peanut proteins in diet of rat, comparison, Ga. 699.

ascorbic acid in, relation to volume of daily production, 238.

bacteria, thermoduric, control, 239.

bacteriological examination methods compared, 674.

bottle washing, refrigeration, and bottle filling, U.S.D.A. 671.

bottles, surface area measurement, method, 95.

canned, Rhode Island receipts in 1940, R.I. 394.

cans, decreases in tin content of solder for, U.S.D.A. 671.

cans, washing, effective, 520.

chocolate, bacteriological study, 675.

choline in, determination, 7.

citric acid, determination in, 731.

clean and cold, N.Y.State 96.

composition, factors affecting, Kans. 671.

consumption in metropolitan New Jersey, N.J. 842.

consumption, increase with income, Pa. 696.

control laws from public health standpoint, 520.

coolers, mechanical, cost of operating, Ind. 602.

cooling methods on farm and effect on quality, Nebr. 105.

Milk—Continued.

cooling practices of producers and distributors, U.S.D.A. 671.

counting on solid media, substitutes for agar in, U.S.D.A. 671.

curd tension, effect of homogenization, U.S.D.A. 671.

delivery, reducing truck mileage in, Vt. 118.

distribution in Manhattan, Kansas, and tire conservation, Kans. 539.

dye reduction in, Vt. 381.

efficiency of fat removal by, Vt. 520.

evaporated, ascorbic acid in, 91.

evaporated, loss of vitamin C in making, Pa. 671.

evaporated, temperature of heating and sterilization and bacteria in, U.S.D.A. 671.

fever, U.S.D.A. 97.

fever cows and normal, blood picture in, 91.

fever, incidence and control, 91.

filtering on the farm, N.Y.State 287.

flavor defects of, evaluation, 96.

fortification, need for, 408.

freezing point and solids-not-fat content, 381.

homogenization, effect on curd tension, digestibility, and keeping quality, U.S.D.A. 95.

homogenization efficiency, determination, Mich. 239.

homogenized—

laboratory sampling, cream top type bottle for, 382.

Hipolysis in, factors affecting, 674.

production and use, 382.

stability of fat emulsion in, Mich. 239.

human, technology, 704.

in copper-containing cans, digestibility, keeping quality, and flavor, effect of rations of cow, U.S.D.A. 671.

lactose in, polarimetric determination, Mo. 5.

lead content, Conn.[New Haven] 127.

maintaining uniform color in by adding carotenoids, 809.

market, tests of filter pads for, U.S.D.A. 671.

marketing in California, public control, 536.

marketing, use of level production plan in, U.S.D.A. 269.

mastic, nature of material in, responsible for Whiteside reaction, 91.

of individual cows, rancidity in, Okla. 808.

of various kinds, thiamin in, 414.

of various types, digestion characteristics compared with human milk, Pa. 127.

oxidation reactions in, relation to dissolved oxygen, 92.

Milk—Continued.

- oxidized flavor in—
 - control, Pa. 671.
 - prevention, 812.
 - role of oxidase-producing bacteria, 92, 812, U.S.D.A. 671.
- pasteurization, high-temperature short-time, thermophilic organisms in relation to, 382.
- place in National Defense program, 520.
- plants, economies of scale in operation, 539.
- plate count and methylene blue reduction test for, 381.
- plate count, cheap and efficient medium for, 811.
- platform inspection, methods, 520.
- produced by cattle fed Haecker standard for milk production, Pa. 671.
- produced in Texas, composition, variations in, Tex. 92.
- production—
 - comparison of legume hays for, Ohio 93.
 - cottonseed meal as corn substitute for, Okla. 808.
 - effect of cystine as supplement to all-alfalfa hay ration for, 93.
 - effect of fasting and refeeding, Mo. 92.
 - effect of feeding shark-liver oil, 809.
 - effect of roughage feeding on, Mo. 92.
 - efficient, balance ration for, 808.
 - ensiling carrots for, Ohio 380.
 - increased use of roughages for, Ohio 380.
 - input-output relation, U.S.D.A. 116.
 - lespedeza seed as protein supplement for, Mo. 380.
 - limiting factors for in grain and timothy hay, U.S.D.A. 670.
 - of Shorthorn dams, relation to carcass quality of their steer progeny, 513.
 - on large-scale farms, Miss. 838.
 - persistency, effect of number of daily milkings, 521.
 - predicting full lactation records from short-time records, 810.
 - program, effect of rising feed prices, 807.
 - relation to development of mammary gland of calf, U.S.D.A. 670.
 - soybeans with and without preservatives for, U.S.D.A. 670.
 - wheat and alfalfa silage v. alfalfa hay for, Ohio 380.
- program, school, of Agricultural Marketing Administration, U.S.D.A. 128.
- properties, effect of cottonseed meal feeding, 808.
- proteins—
 - biological value for dairy helpers, 90.

Milk—Continued.

- proteins—continued.
 - composition and chemical reaction, U.S.D.A. 670.
 - hydroxyamino acids of, 90, 580.
 - industrial products from, U.S.D.A. 723.
 - quality as affected by individual cow, Nebr. 95.
 - quality, bacteriological control, 380.
 - quality, effect of type of cooler and holding time, 807.
 - rancidity in, control, 239.
 - rancidity in, development, effect of ammonia, 382.
 - ration, adequacy of, Mo. 135.
 - receipt and consumption in Newport in 1940, R.I. 394.
 - refrigerated, new tests on, 811.
 - refrigerator, farm, dual motion development in, 257.
 - rich in vitamin A, producing, Ind. 809.
 - samples, variations with season and stage of lactation, Vt. 520.
 - scoring, comparative standardization, 814.
 - skimmed, *see* Skim milk.
 - soft curd, studies, 239.
 - solids and enrichment, 128.
 - solids, defatted, composition, and thiamin and riboflavin in, 674.
 - solids, dry, in institution recipes, 699.
 - solids-not-fat in, factors affecting, Mo. 92.
 - thiamin in, 137.
 - trucking to Providence, R.I. 394, 403, U.S.D.A. 403.
 - types, compared with human milk, digestion characteristics, 274.
 - unidentified nutritional factors in, studies, U.S.D.A. 670.
 - value, as essential food, Nebr. 408.
 - vitamin A in, effect of shark-liver oil in feed, 673.
 - vitamin A in, relation to pasture and feeding practices, seasonal variation, 807.
 - vitamin D in, Ohio 380.
 - vitamin D in, control and verification, 91.
- Milking, effect of suspension on production, U.S.D.A. 670.
- Milkshed, New York, seasonal variation in production, relation to adjustment plans, [N.Y.]Cornell 117.
- Milkweed(s)—
 - and natural rubber, N.Dak. 623.
 - broad-leaved, poisoning of rabbits, 248.
 - floss, latest developments in, 717.
- Millet(s), abnormalities in, induced by X-rays, 317.
- Milo—
 - basin, ordinary, and contour listing for, Kans. 618.
 - strains, *Pythium*-resistant, Tex. 60.
- Mimosa wilt, a major problem, 780.

Mineola—*indiginella*, see Leaf crumpler.*scitulella*, destructive in Idaho, Idaho 224.**Mineral—**

nutrition studies, grating spectrograph for, 190.

oils, see Oils.

Mining scale control, P.R. 656.

Mink—

fur quality, effects of salmon feeding, Alaska 652.

production, equipment, feeding, and breeding, Oreg. 652.

pups, maggots in, Mont. 655.

ration, fish meal as partial substitute for raw meat, 652.

Minnesota Station notes, 288, 721.

Minnesota University notes, 288.

Mississippi College notes, 143.

Mississippi Station notes, 143, 722.

Missouri Station report, 142.

Mite(s)—

and apple maggot, 230.

introduced rat, annoying to man, 796.

on pecan, 783.

poultry, sulfur for control, Fla. 250.

recently discovered on citrus, 230.

Moisture evaporated from watershed areas, determination, 737.

Molasses—

blackstrap, as substitute for hegarl in beef cattle rations, Tex. 85.

for fat lamb rations, Okla. 797.

in poultry rations, 517.

sugar beet, feeding to hogs, Utah 668.

Mold flora development in soil, effect of chemical composition of organic matter on, 451.

Mole, life history, habits, and economic importance, 497.

Molybdenum in nutrition of rat, 853.

Monilinia amelanctheris, description, 486.*Monocrepidius vespertinus* on wheat, Kans. 655.

Montana College notes, 429, 868.

Montana Station notes, 429, 868.

Montana Station reports, 719.

Montmorillonite and organic matter, interaction between, 455.

Moose parasites in northern Minnesota, 683.

Mosquito(es)—see also *Anopheles*, *Culex*, and *Malaria*.

and rodent control, Conn.[New Haven] 499.

anopheline, control, papers on, 662.

anopheline, of Caribbean region, 661.

anopheline, of India, identification of full-grown larvae, 662.

Control Association, California, conference, proceedings and papers, 226.

in Colorado, two-season light trap study, 783.

in Nebraska, 509.

in rice area, biology and control, Ark. 661.

larval populations, measurements, 370.

Mosquito(es)—Continued.

larvicides, waste lubricating oil in, 662.

light trap catches from Iowa cities, 226.

live, trap for collecting, 886.

mineral oil larvicides, tests for suitability, 509.

of Oklahoma, Okla. 661.

of Southeastern States, U.S.D.A. 81.

populations, methods of sampling, 781.

problem in North Dakota, 781.

rice field, breeding habits, 370.

rice field, control, Ark. 783.

spray-killing, improvements made to equipment for, 662.

studies in military establishments, 370.

Mothproofing texts, 656.

Motors, fractional horsepower, protection for, Mich. 690.

Mounting media, notes, 607.

Mucor ramannianus, interaction with thiamin, 602.**Mucorales—**

nuclear behavior in, 310, 486.

spore dispersal in, 310.

Mucosa of pigs, lipids of, during absorption of fat, 234.

Mulberry family, rubber from, N.Dak. 624.

Mulch materials, production in orchard, Ohio 331.

Mules—

breeding, management, and judging, 230.

diseases and parasites, U.S.D.A. 97.

insect pests, U.S.D.A. 97.

Musca domestica, see Housefly(ies).*Muscardi comosum*, virus disease affecting, 495.

Muscular dystrophy, nutritional, cure in rabbit, 716.

Mushroom(s)—

casing soil, control of fungi in, 355.

culture, composting of manure for, Pa. 628.

fly control, mixed thiocyanate and pyrethrum dusts for, Pa. 652.

food value, 846.

Muskmelon(s)—

aphid abundance, relation to cotton, Okla. 783.

breeding, N.Y.State 191.

breeding for the South, 627.

downy mildew, spraying and dusting for, Tex. 60.

fruiting behavior, effect of number of plants per hill and hill spacing, 627.

growing and handling, Calif. 49.

increasing fruit set in, pruning as aid, 764.

leaf spot, effects of sand and nutrient supply, 775.

powdery mildew—effect of vitamin B₁ on, 355.

genes for resistance in, 646.

reaction of strains to, 354.

production, trends and prices by areas, U.S.D.A. 399.

seed production, P.R. 629.

- Muskmelon(s)**—Continued.
 spoilage, analysis of market inspection reports, U.S.D.A. 211.
 variety tests, Ga.Coastal Plain 331.
 vitamin C in, Ohio 409.
- Muskrat(s)**—
 fluctuations in numbers, 380.
 larval cestodes from, 248.
 of Louisiana, parasitological survey, 380.
- Mustard**—
 black, metabolism, effect of sulfur deficiency, 773.
 greens, dehydration tests, 849.
 plants, black, volatile sulfur in, 462.
 tests, Mont. 619.
- Mutations, X-ray-induced visible gene in**
Drosophila, analysis of data, 36.
- Mutton production, increasing after the war,**
 796.
- Mycogone perniciosa* in mushroom soil, control**
 with chloropicrin, 355.
- Mycorhiza(s)**—
 associated with Colorado flora, 741.
 formation in nature, 176.
- Myriangiales, new discoveries in the Americas,**
 25.
- Naphthalene**—
 aerosol, stabilization, 220.
 conversion to salicylic acid by bacterial oxidation, Pa. 583.
- Napier grass**—
 composition and grazing value under controlled management, 622.
 grazing tests, 797.
 potash deficiency symptoms in, 350, 622.
- Narcissus**—
 basal rot increased by use of synthetic hormones and bases, 495.
 bulb fly, biology in Northwest, U.S.D.A. 509.
 bulbs, tolerance to hot water-formalin treatment, variations in, 74.
 lepidopterous pest of, biology, 654.
 mosaic virus, insect transmission of, 495.
- Narcissus tazetta*, virus disease affecting,**
 495.
- Naval stores**—
 making, handling, and storing, wartime changes in, U.S.D.A. 723.
 military uses for, U.S.D.A. 723.
 studies, U.S.D.A. 723.
- Nebraska Station notes,**
 575.
- Nebraska Station report,**
 142.
- Nebraska University notes,**
 575.
- Neighborhoods, natural, white and Negro,**
 representation in administrative agencies,
 Tenn. 124.
- Nemacides, tests of chemicals and hot water as,**
 Ga.Coastal Plain 344.
- Nematode(s)**—*see also* Root knot nematode.
 and usual methods of control, 781.
 golden, of potatoes, U.S.D.A. 202.
 meadow, on citrus, 343.
 meadow, on tobacco, U.S.D.A. 203.
 new, from deer, 384.
 parasitic in sheep, identification of eggs,
 821.
 sheep, survival in pastures, 389.
- Nematodirus helveticus*, percentage incidence in cattle,**
 101.
- Neodiprion***—
lecontei, *see* Pine sawfly, red-headed.
sertifer control, 784.
 spp., development after hibernation in cocoon, effect of temperature, 229.
- Neohaematopus sciurinus*, parasite of squirrel,**
 497.
- Neolasioptera* on wheat, Ga.**
 654.
- Nervous system and vitamin A deficiency,**
 136.
- Neurospora***—
 biochemical reactions in, genetic control,
 151.
crassa, aminobenzoicless mutant, genetic control of biochemical reactions, 180.
tetrasperma, experimental induction of heritable and other alterations in, 25.
- New Mexico College notes,**
 143, 575, 869.
- New Mexico Station notes,**
 143, 575, 869.
- [New York] Cornell Station notes,**
 143, 429.
- New York State Station notes,**
 869.
- New York State Station report,**
 287.
- Newcastle disease virus, affinity to influenza virus group,**
 242.
- Nezara viridula*, *see* Stinkbug, southern green.**
- Niacin—*see also* Nicotinic acid.**
 and niacin amide, suggested use of terms,
 416.
- Nickel**—
 absorption and excretion by man, 279.
 arsenate, determination in treated wood,
 154.
 chromate, determination in treated wood,
 154.
- Nicotiana***—
 cytogenetical studies, 318.
glutinosa and its hybrid, morphological features, 318.
 haploids, cytogenetic studies, 466.
rustica hybrid, incomplete somatoplastic sterility in, 178.
 South American genetic groups and distribution, 25.
 spp., and hybrids, alkaloids in, 289.
tabacum, fruit setting and development, relation to growth hormones, 743.
- Nicotine**—
 bentonite insecticides and copper fungicides, compatibility, 364.
 formation in plants grafted on tobacco,
 174.
 free, in arsenical and cryolite dust mixtures, 500.
 growing tobacco as source of, U.S.D.A. 45.
 in tobacco, determination, modification of Official method, 590.
 synthesis in excised tobacco roots, 744.
- Nicotinic acid**—
 and related compounds, polarographic characterization, 732.
 deficiency, excretion of specific fluorescent substances in urine in, 712.
 deficiency in dogs, 668.
 extraction and assay from animal and plant tissues, 733.

Nicotinic acid—Continued.

- in cereal products, 556.
- in cereal products, determination, nature of interfering chromogens, 437.
- in cereals, assay, 732.
- in chick nutrition, 669.
- in foods, distribution, 136.
- in honey of different localities, 551.
- in meat, 858.
- in prepared foods, 281.
- in wheat and wheat products, 557.
- in wild rice, 857.
- increase in germinating seeds, 313.
- metabolism, 556.
- recommended terms for, 416.
- royal jelly and bee bread as source, 82.
- small quantities, determination, 293.

Nippostrongylus muris infection in albino rats, bio-assay of anthelmintics in, 824.

Nitella, increased irritability in, due to guanidine, 606.

Nitrate studies, Nebr. 15.

Nitrate studies, as related to soil moisture, Oreg. 595.

Nitrification—

- experiments, Tex. 15.
- in Bedford silt loam, effect of potassium chloride, 306.
- threshold pH value for, Ariz. 451.

Nitrogen—

- determination, micro-Kjeldahl, 290.
- distribution studies, 729.

fixation—

- by *Anabaena cylindrica*, 312.
- by *Azotobacter* associated with other bacteria, 305.
- by *Azotobacter*, effect of molybdenum and vanadium, 19.
- in legumes and characters of root-nodule bacteria isolated from, 176.
- in soils by legumes, Mo. 15.
- nonsymbiotic, effect of fertilizers and season, 166.
- studies, biochemical, 461.

metabolism in plants, end products of, 315.

shortage for farm production and best use of available supply, Miss. 738.

shortage, meeting by increased winter legume production, Miss. 41.

sources and rates, Miss. 300.

supplies in wartime, Vt. 454.

Nitrogenous fertilizers, acid-forming, neutralization, relation to nitrogen availability and soil bases, 306.

Nodular worm disease of sheep, U.S.D.A. 528.

Nodule bacteria—

- effect of mixing Ceresan-treated oats with inoculated vetch seed, Oreg. 619.
- serological studies, 741.

North Carolina Station report, 574.

North Dakota—

- College notes, 869.
- Station notes, 429, 869.
- Station, publications of staff of, 720.

Nosema apis in package bees, 668.

Nosema disease, winter losses and queen superscedure due to, 664.

Notocotylus stagnicolae n.sp., life history studies, 230.

Nursery—

- inspection, Conn.[New Haven] 499.
- inspection and quarantine, taxonomic problems in, 499.
- stock, balling, Oreg. 628.
- stock, inspection, certification, and transportation, Ky. 331.
- stock, ornamental, diseases, Oreg. 641.

Nuts—

- culture in Missouri, Mo. 483.
- studies with, Tex. 47.

Nutgrass, control, 626, Miss. 186, 476.

Nutmeg culture, P.R. 628.

Nutrient solutions, dilute, bacterial activity in, 26.

Nutrients, application in form of sprays, N.Y.State 193.

Nutrition—

- and food production in Great Britain, 545.
- animal, *see* Animal nutrition.
- contribution of amino acids to, 277.
- cooperative research in, 545.
- for national defense, 130, 410.
- foundation, grants for, 722.
- human, blood plasma ascorbic acid tests in mass studies, Pa. 715.
- human, mass studies in, 131.
- human, relation to vitamins in food, Kans. 701.
- importance, in prenatal clinic, 410.
- important for older school children, Miss. 275.
- of rural population in Tennessee, 132.
- of school children, improvement, 851.
- plant, *see* Plant nutrition.
- relation to pregnancy and lactation, 131.
- relation to tooth decay, 566.
- study of Virginia, seasonal survey, Va. 276.

Nutritional—

- deficiencies in rats, pathologic aspect, 418.
- status, evaluation, 410, 546.

Oak—

- live, powdery mildew of, 780.
- of Central America, U.S.D.A. 201.
- red, growth, effect of leaf mold v. inorganic fertilizers, 57.
- stump sprouts, origin and development, relation to likelihood to decay, 639.
- white, acorns, germinating, respiration studies, 316.
- willow, acorns as source of vitamin A activity, 377, 803.

Oat(s)—

- and oatmeal, composition and nutritive value, 407.
- and pea hay and silage, average acre yields and production costs, Alaska 617.
- average acre yields and production costs, Alaska 617.

Oat(s)—Continued.

breeding, Ark. 755, Ga. 617, Ga.Coastal Plain 325, Kans. 618, Mont. 618, Nebr. 41, Okla. 755, Oreg. 619, Tex. 42, U.S.D.A. 616.
 composition, factors affecting, 21.
 crown rust resistance, breeding for, relation to winter pasture usage, Ark. 768.
 culture tests, Ga.Coastal Plain 325, Miss. 325, Mont. 619, Tex. 42.
 disease, American, found in western Anatolia, 771.
 disease resistance in, breeding for, Kans. 640.
 disease-resistant and hardier, breeding, results, 484.
 downy mildew disease, 348.
 fertilization in Yazoo-Mississippi Delta, Miss. 41.
 fertilizer tests, Ga. 617, Ga.Coastal Plain 325, Kans. 618, Tex. 42.
 for fattening steers, Okla. 797.
 for grain and winter pasture, variety tests, Tex. 42.
 gray speck production in purified sand cultures, 487.
 ground, quality on Massachusetts markets, Mass. 798.
Helminthosporium leaf spot in Arkansas, U.S.D.A. 343.
 hogging off, Ga.Coastal Plain 373.
 in dark and light, development of xylary elements in first internode, 747.
 increased yields by lime and phosphate, N.C. 446.
 manganese deficiency disease, 168.
 nutrients in, effect of soil fertility, Ind. 737.
 Pioneer and Wintok winter-resistant, U.S.D.A. 616.
 plant juice, ovulating factor in, 91.
 planting tests, Nebr. 41.
 Rangler, resistant to crown rust and smut, U.S.D.A. 616.
 resistant to cold and disease for North Carolina farmers, N.C. 473.
 rolled, packaged in cardboard cartons, cause of infestation by confused flour moth, 782.
 seed, response to hormone treatment, N.Y.State 190.
 seeding, rates and dates, Miss. 41.
 smut(s)—
 heavy annual loss from, prevention, Miss. 63.
 resistance, breeding for, Mo. 41.
 seed treatment for, Mont. 641.
 stem rust, variation in reaction of Anthony variety to, 486.
 superior varieties or strains grown by station, Oreg. 619.
 tests for high vitamin and high chlorophyll foods and feeds, U.S.D.A. 617.
 utilization of absorbed phosphate by, 453.
 Uton, notes, Utah 620.

Oat(s)—Continued.

varieties, Mich. 755.
 variety tests, Ark. 755, Ga.Coastal Plain 325, Kans. 618, Miss. 41, 186, 325, Mo. 41, Mont. 618, Nebr. 41, Okla. 755.
 winter resistance in, breeding for, Ark. 41.
 yield and mineral content, effect of minor element compounds, 456.
 yields, crop rotation v. superphosphate for, Ark. 755.
 yields, effect of seed treatments, Mo. 59.
 Oatgrass—
 tall, for pasture and hay, seeding practices and seeds, N.J. 187.
 tall meadow, sowing with alfalfa to keep out "cheat" grass, Oreg. 619.
Oenothera, tetraploidy, in, colchicine induced, 467.
Oenophagostomum radiatum, percentage incidence in cattle, 101.
 Oestrogen(s)—
 administration to castrated male rats, effect on copulatory behavior, 752.
 effect on young of injected lactating rats, 40.
 source, chemical composition, and richness, 40.
 Oestrogenic activity, variables affecting estimation, 183.
 Oestrone—
 conversion to oestriol in vivo, 727.
 effect on lactogen in pituitary and blood of male rabbits, 753.
 treatment of mammary glands and teats of rabbits, effect, 470.
 Oestrous cycle—
 and reproduction of golden hamster, actions of sex hormones on, 753.
 relation to oogenesis in mice, 614.
 Ohio Station notes, 429.
 Ohio Station report, 426.
 Oil(s)—see also Fat(s) and specific oils.
 ✓ bacteria attacking, 175.
 deposit observations, 74.
 extracted, column for stripping solvents from, 6.
 imported, replacing with modified domestic oils, U.S.D.A. 723.
 light petroleum, for codling moth, 369.
 mineral, carotenoid pigments produced from, 26.
 mineral, suitability as mosquito larvicides, tests for, 509.
 packing, for sardines, analyses, Me. 545.
 promoting oxidation of, 433.
 seed, recovery from press cake, U.S.D.A. 723.
 sprays and other dormant treatments containing oil, 220.
 sprays, performance, effect of temperature and rainfall, N.Y.State 785.
 vegetable, U.S.D.A., 723.
 Oilseed meals, expanding uses of, U.S.D.A. 723.

- Oiticica* nut, curculionid pests of, 505.
 Oklahoma College notes, 429.
 Oklahoma Station notes, 288, 429.
 Oklahoma Station report, 867.
 Okra mosaic disease, nature of, 779.
 Oleomargarine and butter, comparative nutritional value, 701.
Olesioampe pikonemae n.sp., description, 512.
 Olive(s)—
 aerial root system of, significance, 316.
 dehydration of, 850.
 experiments of 1940-41 season, 295.
 fruits, disease of, 493.
 nutritive deficiencies in, diagnosis, 493.
 tree, root system, 316.
Ollula spp., new and interesting from Mt. Shasta, 601.
Omphalia flavida on coffee, 778.
Onchocerca cervipedis in deer of northern Rocky Mountain region, 245.
Oncideres cingulatus, see Twig girdler.
 Onion(s)—
 culture, Mont. 628.
 dehydration tests, 849.
 fertilizer tests, R.I. 326.
 fly, black, bionomics and morphology, 277.
 growth and yield, effects of partial defoliation at transplanting time, U.S.D.A. 47.
 leaf blight, Tex. 60.
 maggot studies, Oreg. 655.
 neck rot prevention in cold storage, Tex. 60.
 production in northern Indiana, economic aspects, Ind. 838.
 rotations for, R.I. 331.
 seed production, Idaho 333.
 seed stocks, tests, N.Y.State 191.
 seedbed diseases, control, 491.
 seedlings, *Ditylenchus dipsaci* in, pathogenesis, 647.
 thrips on carnations in greenhouses, control, Wash. 503.
 thrips studies, Tex. 73.
 variety tests, Ga.Coastal Plain 331.
 virus disease in Portugal, 495.
 weed control in, [N.Y.]Cornell 333.
 Oogenesis, relation to oestrous cycle in mice, 614.
Oospora lactis—
 cultures, growth, effect of acidity and temperature, 91.
 growth rate, 96.
 Ophthalmia—
 contagious, of sheep, 528.
 in blue fox pups, Alaska 652.
 periodic, of horses, U.S.D.A. 97.
 periodic, studies, U.S.D.A. 676.
 Orange(s)—
 composition and time of maturity, effect of fertilizer practices, 198.
 composition, relation to K deficiency, U.S.D.A. 627.
 effect of growth substances on solids and acid contents, 190.
 Orange(s)—Continued.
 Florida, carotenoid pigments in juice, 197.
 juice, canned, flavor deterioration in, prevention, 207.
 juice concentrate, improved, 207.
 juice, packaged, causes of darkening, 441.
 leprosis, 358.
 marmalade of high vitamin C content, improved, 156.
 Pineapple, preharvest sprays for reducing dropping, timing, 190.
 tortrix control, 224.
 trees, adjustment of yields in, fertilizer experiment, 636.
 trees, young, bearing, growing in solution cultures, weekly nitrate absorption, 108.
 Orcein, standardization, progress in, 607.
 Orchard(s)—see also Fruit(s), Apple(s), Peach(es), etc.
 Atchison experimental, Kans. 194.
 border trees, relative yields, 632.
 cover sites, relation to low-temperature injuries, Pa. 628.
 diseases, dormant sprays for, Miss. 479.
 fertility problem in wartime, Pa. 334.
 fertilizers, need of wise use in wartime, Pa. 628.
 grass for pasture and hay, seeding practices and seeds, N.J. 187.
 home, need for pruning, fertilization, and spraying, Miss. 479.
 in eastern Nebraska, supplemental water for, Nebr. 47.
 insects of Pacific Northwest, control, U.S.D.A. 784.
 mites and mealybug problem, 230.
 on sandy soils, legume program, Mich. 766.
 site and mulch treatment, relation to winter injury, Kans. 628.
 soil(s)—
 management, Nebr. 47.
 movement of potassium fertilizer in, Ohio 331.
 porosity, effect on root behavior, Mich. 596.
 under sod, mulch, and cultivation, aggregation of, 596.
 sources of N for, Pa. 628.
 work, careful planning to alleviate labor shortage, Colo. 765.
 Orchid—
 fruits, correlation of growth with internal development, 33.
 seeds, sterilization, aerosol-hypochlorite technic, 496.
 soft rot, cause, 649.
Orechopeas wickhami, parasite of squirrel, 497.
 Oregon Station report, 720.
 Organic acids, ether soluble, role in salt absorption by plants, 462.

Organic matter—

and montmorillonite, interaction between, 455.

changes in during decomposition of compost heaps, 597.

effect on properties of Berks silt loam, 185.

in soil, effect of texture of erosion material, N.Y.State 160.

incorporated, and organic mulches, effect on erosion and soil structure, 185.

incorporated, v. mulches, effect on soil and moisture conservation, 185.

need of Paulding County soils for, Ohio 301.

of soil, fractionation, relation to quality, 597.

of soil, studies, 185, Nebr. 15.

Orius insidiosus, predator on cotton insects, 72.

Ornamental plants, shrubs, and trees, *see* Plant(s), Shrubs, and Tree(s).

Ornithodoros—

hermsi, biology, 796.

moubata, relative toxicity of rotenone and pyrethrum to, 664.

moubata, toxicity of pyrethrum to, 654.

ticks, medium for transportation of disease agents, 664.

Orobancha ludoviciana, new hosts of, 347.

Orthophosphoric acid as cheese solvent, 674.

Oryzaephilus surinamensis, *see* Grain beetle, saw-toothed.

Ostertagia ostertagi, percentage incidence in cattle, 101.

Otiobius megnini, notes, Mont. 652, 655.

Ova, tubal, transportation of, 184.

Ovarian cycle of helpers during summer in Union of South Africa, 323.

Oviduct and egg transport in albino rat, 752.

Ovulating factor in rabbit, frozen plant juice as source, 752.

Ovulation—

and reproduction in pigeons, effect of series of steroids on, 752.

in fowl, hormone-induced, 751.

Owlet moths taken at light traps in Kansas and Nebraska, U.S.D.A. 659.

Oxygen, dissolved, recordings with dropping mercury electrode, 6.

Oxytocin, effect on milk and butterfat secretion, 809.

Oysters, canned, production of staphylococcus enterotoxin in, 400.

Pails, electrically heated, Pa. 688.

Paint poisoning in cattle, U.S.D.A. 97.

Pales weevil injury to white pine plantings in New England, Conn.[New Haven] 499.

Palms of genus *Cocos*—

in dry regions of Bahia, Brazil, importance, 740.

with descriptions of two new species, 740.

Pantoum dennettense n.sp. from North Carolina, 311.

Pantomorus—

leuoloma, *see* White-fringed beetle(s), n.spp. 367.

Pantothenate, effect on appetite and growth of rat, 558.

Pantothenic acid—

and microbiological approach to vitamin study, 705.

in honey of different localities, 551.

in human nutrition, 705.

in wheat and wheat products, 557.

in wild rice, 857.

microbiological assay for, growth stimulants in, 734.

requirement, relation to age in rat, 712.

royal jelly and bee bread as source, 82.

urinary excretion, 416.

Pantry insects, N.J. 73.

Papayas, mature green, infestation by Mediterranean fruitfly, 794.

Paper—

and paperboard products, number of bacteria in, effect of mill operations, 443.

for packaging perishable foods, public health compliance, 12.

research, N.Y.State 149.

Paphiopedilum fruits, intermittent growth, 33.

Paralysis, fowl—

and other forms of avian leucosis complex, U.S.D.A. 98.

control by selection and culling, Pa. 676.

control, role of breeding in, N.J. 750.

effect on growth rate of Rhode Island Reds, Mo. 84.

studies, Kans. 676, Mo. 99.

Paralysis, infectious bulbar virus, infection of chick embryo with, 387.

Parasites—

animal, notes, 502.

hymenopterous, technic for routine examinations of, 511.

requirements for more than hosts, 500.

studies, Conn.[New Haven] 499.

Parasitology, clinical, textbook, 523.

Paratetranychus—

citri, *see* Red mite, citrus.

pilosus, *see* Red mite, European.

viridis on pecan, 783.

Paratheresia diatraeae, receipt of shipments, liberations and shipment to Cuba, P.R. 655.

Parathyroid glands, vitamin D, and calcium metabolism, 91.

Paratiroza cockerelli, *see* Potato psyllid.

Paratyphoid—

in turkey poults and chicks, Oreg. 676.

in turkeys, sanitation important in control, N.C. 532.

Paris green, automatic distribution, 657.

Parlatoria chinensis in St. Louis, status, 499.

Parsnips, fertilizer tests, R.I. 326.

Parthenocarp, natural and artificial, 317.

Partridge(s)—

chukar, increasing egg production of, Mo. 72.

Partridge(s)—Continued.

Hungarian, endoparasites of digestive and respiratory tracts, 498.

Paspalum—

notatum scab in Florida, U.S.D.A. 58.
species, flowering habits, 622.

Passion fruit brown spot, 215.

Pasteurella—

localized in central nervous system of sheep, 102.
nonhemolytic, serological types in, 815.
septica, infection of bovine udder, 820.

Pasteurization—*see also* Milk.

laboratory, for solving milk problems, 673.

relation to thermoduric bacteria, 520.
short-time high-temperature, 520.

Pasture(s)—*see also* Grass(es), Grassland, and Meadows.

adjustments in wartime, 514.
areas, soil tests on, Ga. 595.
bluegrass, grazing systems with beef cattle, Mo. 84.
cereal, comparative palatability, 93.
cost of seedling and yields, Mo. 110.
dairy cattle, improving, 90.
demonstrations, cooperative, stressing of better soil fertility in, N.C. 473.
economy of, Utah 620.

effect of N fertilization on seasonal distribution of yields and on N recovery in herbage, 757.

ergot epiphytotic in, U.S.D.A. 203.

establishment, Ga.Coastal Plain 473.

fertilization, Mo. 41, Okla. 756.

fertilizer tests, Ga. 617, Miss. 186, 325, Mont. 619, Tex. 42.

Florida, annual lespedeza for, Fla. 329.
for developing pullets and for laying hens, 377.

grasses, *see* Grass(es).

herbage, effect of phosphatic fertilizers on, 185, Va. 327.

herbage on soil types, composition and yield, effect of lime and fertilizers, 185.

improvement, 797, U.S.D.A. 617.

improvement, profitable, N.C. 473.

improvement, value of lime and P in, N.C. 473.

in limestone area, provision and utilization, Ind. 837.

irrigated, seed mixtures for, Mont. 619.

irrigation tests, Okla. 756.

merits of white clover strains for, Ohio 326.

mixtures, botanical composition, effect of clipping v. grazing treatments, 757.

mixtures, revegetation study, Okla. 756.

on alkali land, Utah 620.

permanent, Mo. 15.

permanent, improvement, Nebr. 41.

permanent, seedling, Mo. 757.

permanent, year-round program for establishment, Miss. 325.

Pasture(s)—Continued.

plants, composition, effect of soils and fertilizers, 20.

preparing brush land for, Miss. 253.

returns, increasing, phosphorus and lime for, Miss. 739.

seeds, management, and fertilizers for, Ga.Coastal Plain 372.

soil nutrients and pH of, effect of surface-applied phosphate and limestone, 185.

studies, Miss. 186, Mo. 41.

studies at Morgan Horse Farm, U.S.D.A. 800.

studies, proposed modification of fluorimetric estimation of riboflavin, 591.

supplementary, W.Va. 473.

systems, all-season, development, Ohio 326.

tests and grain feeding for dairy cattle, Ga.Coastal Plain 380.

typical plains, composition, grazing value, and changes of herbage, 514.

vitamin A content, increasing with limestone and phosphate, N.C. 520.

yields, effect of phosphates, Miss. 186.

Pea(s)—

aphid—

control, Oreg. 655.

control program, concentrated sprays in, 503.

control, rotenone-nicotine dusts for, 782.

injury to peas, effect of temperatures, 782.

on fall-sown legumes, time of seedling for control, 76.

Austrian Winter, diseases, Ga. 640.

Austrian Winter, fertilizer tests, Ga. 617.

cannery, fertilizer analyses and placement, statistical studies, 192.

canning, maturity, effect of inoculation, 630.

canning, soil requirements, N.Y.State 191.

canning, studies, Alaska 630.

canning, value of Spergon as seed protectant, 355.

effect of calcium and nitrogen, 630. ✓
effect of fertilizer placement, Va.Truck 332.

frozen, determination of maturity, 151.

Fusarium wilt resistance, factors affecting, 212.

growth stimulation by fungicidal seed protectant, 212.

inoculation v. nitrogen fertilizers, N.Y.State 191.

meal, Alaska, protein value for chickens, Wash. 517.

plants, growth, effect of seed treatment, N.Y.State 203.

root rot, fungi associated with, distribution and importance, N.Y.State 66.

Pea(s)—Continued.

seed and canning, irrigation of, Mont. 333.

seed-borne micro-organisms, N.Y.State 203.

seed protectants, effect on nodule bacteria, N.Y.State 203.

seed, response to hormone treatment, N.Y.State 190.

seed treatment, Miss. 354, Tex. 59. tests, Ga. 627.

thiamin determination in, 438.

thiamin in, effect of sodium bicarbonate, 858.

unusual injury by thrips, 72.

varieties, new, comparison, N.Y.State 764.

varieties, new, for canning and freezing, testing, N.Y.State 191.

variety tests, Ga. 627, Ga.Coastal Plain 331.

weevil studies, Mont. 655, Oreg. 655.

Peach(es)—

and citrus, comparative transpiration rates, 338.

aphid, green—

breeding hosts of, 499.

internal parasite of, bionomics, 371 bacterial canker, 214.

blight and leaf curl control, effect of added materials to bordeaux mixture, Calif. 492.

borer, western, control, 80.

cankers, cause and control, N.Y.State 203.

carotene in, Ark. 845.

crop, Illinois, marketing, Ill. 403.

culture in Missouri, Mo. 767.

culture tests, sods and clean culture, 627.

diseases in Colombia, control, 491.

Elberta, on Lovell and Shalil roots, vegetative responses, 634.

fertilizer tests, Ga. 627, N.Y.State 193.

flower parts, initiation of, 338.

fruits, chemical changes in developing, N.Y.State 194.

fruits, developing, diameter and weight, relation, 339.

fruits, thinning, Ark. 762.

Halehaven, development, effect of nitrate of soda, Ill. 338.

insects, La. 362.

juice, preparation and processing, 156.

leaves, phosphate content, 631.

mosaic, 843.

moth, oriental, studies, 217.

orchards—

border trees, relative yields, 632.

cover crops for, Ga. 627.

root knot and cover crops in, Ga. Coastal Plain 344.

soil management, R.I. 331.

pits, Elberta, methods of handling for nursery germination, 195.

preparing for frozen food lockers, 700

Peach(es)—Continued.

preservation with sulfurous acid, Ga. 700.

root development, effect of pruning, Ga. 627.

root diseases, control, 484.

roots, growth and distribution, Ga. 627.

rootstocks, Shalil, nematode-resistant, N.C. 476.

scab and brown rot, spraying for, Tex. 60.

soil management study in Kentucky, 52. summer spray program for, N.Y.State 203.

suture spot of unknown cause, 777.

time interval between full bloom and fruit maturity, 334.

trees, ethylene dichloride unsafe on, Pa. 652.

trees, pruning, Ark. 762.

trees, root distribution, effect of pruning, 634.

trees, root knot resistant, Ga.Coastal Plain 344.

twig blight, epidemic proportions in unsprayed orchards, 492.

twigs, nature of and relation to gummosis, 648.

unsulfured, drying experiments, 296

use of preharvest chemicals on, Ga. 627. varieties—

canning quality, Ark. 46

for New York State, N.Y.State 767. new, 196

new, development, U.S.D.A. 627.

new, in Delta, Miss. 52.

relative acidity and tannin content, 634, 635.

tests, Ga., 627, Ga Coastal Plain 331, Miss. 191

virus disease studies, developments in, 357.

vitamins in, 627.

wart, a virus disease, 648.

wartime marketing problems of, Ark. 841.

wavy-leaf character in, inheritance, 318.

X disease—

control by killing chokecherry, 215. N.Y.State 215.

summary, 215.

western, 357.

Peachtree borer—

control, Miss. 369, N.C. 476.

control in New York State, 363.

control, insecticides for, N.Y.State 785.

control, new materials for, Ohio 362.

effect on trees of ethylene dichloride emulsion treatment for, 782.

Peafowl, sex inversion in, 323.

Peanut(s)—

and cotton in rotation, need of more K for, U.S.D.A. 617.

and milk proteins in diet of rat, comparison, Ga. 699.

as feed for pigs, Ga. 666.

as soil-depleting crop, N.C. 473.

Peanut(s)—Continued.

- breeding, Ga. 617, Ga.Coastal Plain 325, Tex. 42.
- culture experiments, Ga.Coastal Plain 325.
- diseases, studies, Tex. 59, U.S.D.A. 640.
- effect of handling in field on quality of nuts and oil, Ga. 579.
- emergence improvement by seed treatment, N.C. 485.
- fertility indices for, comparison. 185.
- fertilizer tests, Ga.Coastal Plain 325, Tex. 42.
- flour for human consumption, 699.
- hogging off, Ga.Coastal Plain, 373.
- leaf spot, control, Ga.Coastal Plain 325.
- leaf spot, fungicidal dusts for, 484, Ga. 640, N.C. 485.
- need of increased production and yields, Miss. 755.
- nutrient absorption by, time and rate, 185.
- nutrient deficiency symptoms in, N.C. 473.
- on vine and sweetpotato meal as milk-producing feed for dairy cattle, Ga. 671.
- or peanut butter in human diet to improve protein value and vitamin B complex in, Ga. 699.
- production on Coastal Plain, Ga.Coastal Plain 188.
- proteins, Ga. 579.
- proteins, threonine, serine, cystine, and methionine in, 580.
- response to lime and K, N.C. 473.
- root, stem, and fruit decay associated with fungi, N.C. 485.
- seed treatment, 484, Ga. 640.
- spacing tests, Ark. 755.
- utilization, Ga. 579.
- varieties and strains, yield differences, N.C. 473.
- varieties, large and small-seeded, yield and shelling properties, 186.
- variety tests, Ark. 755, Ga. 617, Ga.Coastal Plain 325.
- wartime production, seed treatment as aid in, 209.
- yield increase due to early planting and seed inoculation, N.C. 473.

Pear(s)—

- Bartlett, preharvest drop, sprays for control, 338.
- Bartlett, softening and soluble solids in, effect of soil moisture, 634.
- cull dried, feeding value for hogs, Oreg. 666.
- fire blight in Florida, U.S.D.A. 58.
- fruit setting and progeny fertility in, Vt. 476.
- juice, preparation and processing, 156.
- leaf spot control, spraying for, Mo. 59.
- orchards, border trees, relative yields, 632.
- pollination, Oreg. 628.

Pear(s)—Continued.

- pollination, position on cluster, and set, interrelation, Vt. 52.
- production under differential soil moisture treatments, relation to pruning, Oreg. 628.
- psylla control, dinitro insecticides and oil sprays for, N.Y.State 785.
- residue, dried, for pig feeding, 376.
- scab and storage rot, control, Oreg. 641.
- thrips in prune orchards, control, 74.
- time interval between full bloom and fruit maturity, 334.
- trees, boron deficiency in, 492.
- variety tests, Ga.Coastal Plain 331, Miss. 191.
- virus stoney pit disease, Oreg. 641.

Peats in New Jersey, nature and properties, 597.

Pecan(s)—

- fertilizer and cultural needs, Ga.Coastal Plain 331.
- growth, yield, and quality, effect of fertilizer and time of application, 54.
- insects in middle Georgia, 363.
- new, Cape Fear, development, N.C. 476.
- nut casebearer studies, Tex. 73.
- rosette, soil applications of zinc sulfate for control, 778.
- trees, delayed foliation, 636.
- trees treated with indolebutyric acid at transplanting, root and shoot production by, 627.
- trees, zinc sulfate treatment, improved method and duration of effect, 778.
- variety tests, Ga.Coastal Plain 331.

Pectin(s)—

- and pectic enzymes, chemistry of, N.Y. State 272.
- decomposition by intestinal bacteria, 569.
- regulating methoxyl in methods, 432.
- uses in wartime, N.Y.State 735.

Pectinophora gossypiella, see Bollworm, pink.

Pellagra, story of treatment with nicotinic acid, 705.

Penicillin—

- activity in vitro, 388.
- chemotherapeutic activity, 388.
- extraction from *Penicillium notatum*, 388.
- mechanism of action, 388.
- new antiseptic agent from corn sugar, U.S.D.A. 723.
- nitrogenous character, 172.

Penicillium—

- claviforme*, antibacterial substance produced by, 600.
- notatum*, cultural characteristics, relation to production of antibacterial substance, 460.
- roqueforti*, growth and enzyme activity, Minn. 522.
- spp., production of bacteriostatic substances by, 601.

Pennsylvania College notes, 143.

Pennsylvania Station notes, 143.

Pennsylvania Station report, 720.

- "Penny-a-pig" program, 513.
 Pentatomids, parasites, receipt of shipments of, P.R. 656.
Penttilia castanea, control of scale insects by, P.R. 655.
 Peony root knot, failure of hot-water treatment, Ohio 344.
 Pepper(s)—
 black, culture, P.R. 623.
 composition of artificially produced parthenocarpic and normal fruits, 764.
 dehydrator for, Colo. 849.
 diseases, virus, 209.
 growth and yield, effects of partial defoliation at transplanting time, U.S.D.A. 47.
 maggot, studies, Ga. 655.
 Perfection pimienta, time of flower primordia differentiation, effect of photoperiod, 477.
 pimiento, transplanting solutions for, Ga. 627.
 pungency in, chemical test, Mich. 630.
 seed stocks, tests, N.Y.State 191.
 weevil in California, control, 79.
 weevil studies, U.S.D.A. 368.
 Peppermint oil, determination of methol in, acetyl chloride as reagent, 731.
 Perilla production tests, Kans. 618.
Periplaneta americana, see Cockroach, American.
 Permeability—
 of soils to water, Nebr. 15.
 salt accumulation, and metabolism in plants, interrelations, 314.
Peromyscus, aberrant ratio in, 469.
Peronospora—
 genus in the Punjab, 204.
 on soybean in Virginia, U.S.D.A. 203.
 parasitica, oospore production in cabbage seedlings by, 484.
 tabacina, cause of tobacco downy mildew, 774.
 Perosis—
 in chicks, prevention by factors other than manganese, 377.
 in turkey poult and choline in diet of, 807, 826.
 in turkey poults, development and prevention, 237.
 prevention by blotin, 669.
 Persimmon leaves and fruit, ascorbic acid in, 313, 861.
 Pest control, use of toxic polynitro derivatives in, 654.
 Pest survey and insect control, Okla. 783.
 Petroleum oils as insecticides, developments in use, 368.
Petunia axillaris, colchicine stimulation of seed germination, 28.
 Pheasant(s)—
 Chinese, nesting in Willamette Valley, Oregon, 361.
 pH of digestive tracts of, 236.
 ringed-neck, *Heamita* sp. from, 686.
Phenacoccus—
 aceris control by dormant sprays, 223.
 spp. of northeastern America, 223.
 Phenol(s)—
 disinfectants, synthetic, 243.
 in meat and fat, estimation, 589.
 Phenothiazine—
 as anthelmintic for sheep, 245.
 colorimetric determination, 731.
 effect on blood of fowl, 250.
 effect on hemoglobin in fowls, Kans. 678.
 feeding to poultry in various amounts, effects, 250.
 Phenylalanine, metabolism, role of ascorbic acid in, 419.
 Phenylthiocarbamide, ingestion, grayling of hair produced by, 412.
Phialophora malorum and *Sporotrichum malorum*, relation, 492.
Phomopsis—
 cinereascens on fig branches in Brazil, 493.
 occulta and *P. juniperovora*, taxonomy, distribution, and pathology, 779.
Phormia regina—
 as transmitter of *Endamoeba histolytica*, 370.
 seasonal distribution, 81.
 Phosphate(s)—
 amperometric determination with uranyl acetate, 290.
 and lime for pasture, Miss. 739.
 comparison, Tex. 599.
 deficiency in Idaho soils, determination by *Azotobacter* plaque test, 166.
 determination of sodium in presence of, 586.
 experiments, Ark. 15, Miss. 159.
 fertilizers, field experiments with, R.I. 167.
 fixation in soils, 22, 167.
 reserves of Utah, revised estimate, Utah 455.
 waste pond, compared with rock phosphate and superphosphate as fertilizer, 456.
 Phospholipids—
 in dairy products, 7.
 oxidation in presence of ascorbic acid and carcinogenic chemicals, 584.
 Phosphoric acid—
 contents of sewage sludges, N.J. 738.
 in soil extracts, determination, 150.
 Phosphorus—
 absorption from rock phosphate, effect on composition and dry weight of corn, 21.
 analysis of plant material, 291.
 and lime as primary soil needs, Pa. 596.
 compounds, organic, dephosphorylation by soil catalysts, 598.
 deficiency, preventing normal succession on areas of Bull Run Mountain in Virginia, 311.
 dietary absorption by rat, effect of aluminum, 854.

Phosphorus—Continued.

- economy in animal organism, 705.
- in expressed vegetable juice, 559.
- inorganic, concentration in whole blood of dairy cattle, 94.
- organic, availability to plants and de-phosphorylation, 314.
- radioactive, use in translocation studies, 744.

Photobacterium spp., studies, 457.**Photomicrograph**, still and movie, technic for obtaining accurate exposure times, 782.**Photoperiodism**—see also Day length.

- accompanying autotetraploidy, 34.

Photosynthesis—

- in forest trees, Vt. 483.
- mechanism, from study of green plant, 25.
- of algae and other aquatic plants, 316.
- quantum efficiency, 316.
- rates in fruit trees, relation to leaf structure, Kans. 628.
- studies, using radioactive and stable isotopes of C, H, and O, 456.

Phycomyces blakesleeianus—

- growth, relation to pyrimidine analog of thiamin, 313.
- interaction with thiamin, 602.
- spores, dormancy and growth substances, 770.

Phycomyces pattern, 480.**Phyllocoptes**—

- destructor, status, 781.
- oleivorus, see Citrus rust mite.

Phyllophaga—

- beetles, descriptions, new genera and subgenera, 227.
- lanceolata on wheat, Kans. 655.
- spp., life history, 367.

Phyllosticta—

- grandimaculans, notes, 777.
- solitaria, notes, Okla. 356.
- spp., new and interesting from Mt. Shasta, 601.

Phyllotreta vittata discedens—

- cube and nicotine in control of, 783.
- studies, Tex. 73.

Phylogeny and taxonomy, 460.**Phymata pennsylvanica americana**, economic status, appraisal, 75.**Phymatotrichum omnivorum** sclerotia elimination from soil, antibiosis in, 61.**Physalospora miyabeana** on willow, 497.**Physox varicornis**, effect of dormant sprays on, 510.**Physiology**, annual review, 409.**Phytomonas**—

- fasciens, inoculation of strawberry plants with, 215.
- medicaginis phaseolicola, variation in strains, Nebr. 59.
- michiganensis on tomato, control, 355.
- mors-prunorum, notes, 214.
- poinsettiae n.sp. description, 496.
- spp., recommended change to genus Corynebacterium, 204.

Phytomonas—Continued.**stewartii**, mutation by X-ray irradiation, 318.**syringae**, cause of Hibiscus leaf spot, 649.**Phytophaga destructor**, see Hessian fly.**Phytophthora**—

- camblivora on chestnut, 216.
- capsici rot on tomato, control, Colo. 776.
- cinnamomi—

- growth, relation to pyrimidine analog of thiamin, 313.

- Interaction with thiamin, 602.

- on avocado, Calif. 494.

crown and root rot of ornamental trees and shrubs, 779.**genus**, morphologic and physiologic studies, Mo. 59.**infestans**—see also Potato blight, late.

- destructive on tomatoes, U.S.D.A. 640.

- on weed *Solanum sarachoides*, U.S.D.A. 640.

root rot of citrus, cause of decline in New South Wales, 648.**spp. from dead roots of orange and lemon**, Calif. 495.**spp. on citrus**, 494.**Pichia** on dates, 358.**Pickle(s)**—

- from different areas, vitamin A and C in, 295.

- products, pasteurization, 155, 295.

- spicing, factors affecting, 295.

Pickleworm control, 654, 791, N.C. 500.**Pickling**, Department of Agriculture work on, 295.**Pig(s)**—see also Sows and Swine.

- and corn supplies and prices, control, U.S.D.A. 111.

- artificial vagina for, Mo. 34.

- at market maturity, growth rates, weights, and scores for, relation, 513.

- at weaning, grains and protein supplements for, Mo. 84.

- attempts to modify sex ratio in, 610.

- bleeding disease, studies, 319.

- blood coagulation, defect in mechanism, 323.

- blood picture of, 323.

- breeding, management, and judging, 230.

- brooder, electric, description, Utah 692.

- brooder, lamp-type electric, Oreg. 692.

- brooders, Nebr. 105.

- calcium requirements, Kans. 666.

- cottonseed meal in large quantities for, Miss. 86.

- crossing three breeds, Ohio 318.

- development, effect of sex, 610.

- diseases, U.S.D.A. 390.

- diseases and parasites, U.S.D.A. 98.

- endogenous nitrogen metabolism, 375.

fattening—

- at various growth stages, effect of season, 375.

- concrete wallows for, Tex. 85.

- corn supplements for, N.C. 514.

Pig(s)—Continued.**fattening—continued.**

fish meal for, Ohio 87.

Sudan grass and oats pasture for, Tex. 85.

feeding—

cacao byproducts, 376.

carotene products to, results, 234.

cottonseed meal with charcoal and minerals, Miss. 231.

experiments, 86.

experiments with dried *Clostridium* residue, 376.

experiments with dried pear residue, 376.

finishing, rations for, Miss. 231.

goiter in, prevention with iodized salt, Mont. 676.

ground soybean hay for, U.S.D.A. 665.

growth rates at different ages, genetic and environmental correlations, 610.

helminth parasites of in Queensland, 529.

inbred line, development from crossbred foundation, 610.

inbred lines, experimental design for testing, 611.

inbreeding and improvement, Mo. 34.

inheritance in, study by breed colors and morphological conditions, Mo. 34.

length of feeding period, economic analysis, 393.

low agglutination reactions in unbred virgin gilts, Mo. 99.

market, protein-mineral-vitamin supplements to barley rations, 668.

measures of growth rate for use in selection, 516.

nicotinic acid for, Mo. 84.

nutrition, vitamin B₆ in, 516.

nutritional inadequacy of beet molasses rations, Utah 516.

oat and pea pasture with and without grain for, Alaska 666.

on peanut ration, deficiency symptoms in, Fla. 87.

on rape pasture, soybean meal for, Pa. 666.

on Sudan grass pasture, fattening, supplements for, Nebr. 84.

parasites of and treatment for removal, U.S.D.A. 676.

pasturing annual crops with, Mont. 619.

photosensitization produced by phenothiazine, 245.

Poland China, variance of 180-day weights, factors affecting, 182.

potassium requirements in feed, Ga. 666.

raising in Arizona, Ariz. 668.

raising, self-feeder and movable automatic waterer as labor savers in, Colo. 834.

rations, proteins in, U.S.D.A. 665.

runts, gains on special rations, Mo. 84.

salt tolerance and salt poisoning, U.S.D.A. 98.

Pig(s)—Continued.

sensory neuron degeneration in, control, 799.

skim milk in rations, Ark. 88.

skim milk, whey, and pasture for, Ark. 797.

sorghum grains for, Nebr. 84.

soybean feeding methods, 797.

suckling, early infections with helminth parasites, 384.

suckling, management, Ga.Coastal Plain 373.

sugar beet molasses for, Utah 668.

supplements to corn and tankage for, Pa. 666.

transportation types, average rates charged for, Ohio 394.

vitamin A and carotene requirements, 798.

vitamin A requirements, Tex. 85.

vitamin requirements, 514.

Wessex Saddleback, color variation in, relation to conformation and usefulness, 319.

wheat as feed for, Utah 667.

Pigeon fly, U.S.D.A. 98.

Pigeon(s)—

directed mutation in, possible case of, 749.

immunogenetic studies of species, 37.

pH of digestive tracts of, 236.

vitamin requirements, Mo. 84.

Pigments, pure, distribution between immiscible solvents, 435.

Pikonomia—

sawflies, new *Olesicampe* parasite of, 511.

spp., development after hibernation in cocoon, effect of temperature, 229.

Pilchard meal—

and soybean meal mixture, gross values, 236.

feeding value, effect of heat and moisture, 374.

Pillbugs, control, 501.

Pimientos, *see* Pepper(s).

Pine(s)—*see also* White pine.

beetle, mountain—

native predators, biology, 367.

predators, laboratory propagation of, 791.

beetle, western, control through tree selection, 659.

blister rust, *see* White pine blister rust.

direct seeding, effects of stratification, 200.

eastern, canker of, associated with *Atropella tingens*, 780.

fused needle disease, 496.

gall-forming *Peridermium* on, experimental autoecism and other studies, 71.

in east-central Alabama, natural reproduction, Ala. 768.

jack, red-stained ties under service conditions, decay in, 216.

Pine(s)—Continued.

- Jack, seedlings, effect of thiamin and niacin on growth, 483.
loblolly, buttressed trunks, effect of annual spring fires, 639.
loblolly, management in pine-hardwood region, 56.
loblolly, yield of even-aged stands in Louisiana, 200.
lodgepole, interception of rainfall by, 445.
lodgepole, stands, effect of cutting on rainfall interception, 639.
longleaf, sites, variations in fire danger factors, 202.
of Arkansas, dendrochronology, 201.
plantations in Piedmont section of Georgia, ice damage to, 343.
ponderosa, region of Pacific slope, fire as ecological and silvicultural factor in, 639.
red, saplings, height related to density 200.
sapwood, *Trichoderma lignorum* in, effect, 216.
sawfly control, 784.
sawfly, red-headed, mortality of young pines defoliated by, 229.
sawfly, red-headed, on seedling pines, 664.
Scotch, disease due to *Diplodia pinea*, 651.
Scotch, planting stocks, tests, N.Y.State 200.
seedlings, growth in water culture, effects of boron concentrations, 496.
slash, studies with, Tex. 47.
small crowned ponderosa, value in reserve stands, 342.
Virginia, cankered, undescribed *Atropellis* on, 359.
Pinus species, differentiation by colorimetric tests of their pitch, 638.
Pipe discharges, measuring, use of current meters in, Colo. 829.
Piricularia oryzae, notes, Ark. 769.
Pistol can bearer control, Pa. 652.

Pituitary (ies)—

anterior—

- extracts, effect on poultry, 321.
hormones, extraction and separation, Mo. 34.
of cattle and female rabbits, prolactin in, 91.
of rabbit and guinea pig, lactogen in, Mo. 34.
cystic, in young cattle with vitamin A deficiency, 375.
glands of albino mice compared to other species, lactogen in, 471.
glands of female rats treated with antigonadotropic serum, increase in gonadotropic content, 39.
glands of male rat, gonadotropic hormone in, effect of ascorbic acid, 91.
hormones, comparative assays for mam-mogenic growth factor, 614.

Pituitary (ies)—Continued.

- interstitial-cell-stimulating hormone—
biological properties, 39.
standardization methods, 39.
of livestock, mammogen content, Mo. 34.
of pseudopregnant rabbits, lactogen in, 754.
of rabbit, fat metabolism hormone of, Mo. 34.
of swine, gonadotropins of, 38.
rat thyrotropic hormone in, Mo. 34.
sheep, separation of adrenotropic hormone from, 616.
weight of albino rat, relation to body weight, 321.
Plane tree, London, canker stain control, N.J. 651.
Planning Authority, Central, of Great Britain, U.S.D.A. 405.
Plant(s)—see also Flora(s) and Vegetation.
absorption of inorganic nutrients by, relation to pH, 603.
and soil research, Federal-State cooperation in, 15.
ants and termites, ecological relations, 311.
aquatic, photosynthesis of, 316.
as potential sources of rubber, testing, U.S.D.A. 627.
ascorbic acid in, physiological activity, 29.
beds, chloropicrin as disinfectant for, 345.
biochemistry and physiology, 312.
biology, textbook, 126.
breeding possibilities for southern Florida, 197.
bugs control in citrus groves, 503.
cancerous neoplasm of, 204.
carnivorous, 601.
carotene determination in, 152.
carotene development in, 232.
cell(s)—
accumulation of salt and permeability in, 314
division and growth, test of chemicals other than colchicine for effect on, N.Y.State 193.
walls, dispersion of cellulose strands in, 317.
chromosomes, see Chromosome(s).
communities of—
Piedmont, N. C., ecological analysis, 311.
southeastern coastal plain, ecological problems, 311.
Welaka area, Florida, 461.
copper deficiency in, 60.
deficiencies, relation to soil composition, Tex. 21.
desert, see Desert.
diagnosing mineral deficiencies, importance of determining concentration of C in plant extracts, 484.
dicotyledons commonly cultivated in Brazil, keys for, 310.

Plant(s)—Continued.

- disease(s)—*see also* Fungi(us) and different host plants.
 and control, recent outstanding cases in South Dakota, 208.
 control, national policy, 484.
 control, papers on, 58.
 host-parasite check-list revision, U.S.D.A. 58, 202, 640.
 in Canada, check-list, 344.
 in Ceylon, 485.
 in Maine, additions to, U.S.D.A. 58.
 in Massachusetts, U.S.D.A. 203.
 in Nebraska prior to July 18, 1942, U.S.D.A. 58.
 in U.S. prior to 1917, estimates of losses from, U.S.D.A. 58.
 nature and prevention, 202.
 nature, cause, and control, Miss. 203.
 nonparasitic, in Chile, 485.
 papers on, 640.
 parasitic, in Chile, 485.
 recorded in Scotland, 203.
 surveys, prevention of losses by, Okla. 769.
 distribution records of Indiana, 310.
 drug, *see* Drug plants.
 effects of prolonged rotation on horizontal klinostat, 170.
 exchange, technic of, U.S.D.A. 768.
 flower-bud initiation, effect of flower-producing hormones, Mo. 47.
 flowering composites, photoperiodic after-effects in, 32.
 fluorine content, effect of fertilizer treatments, 456.
 food availability in alkaline-calcareous soils, Ariz. 20.
 grafted on tobacco, formation of nicotine in, 174.
 greenhouse culture, Okla. 763.
 greenhouse, gas injury, Kans. 628.
 groups, temperature reaction, mutation, and geographical distribution in, 26.
 growing in quartz sand substrate, availability of adsorbed ions to, 455.
 growth and differentiation, symposium, 33.
 growth and nitrogen balance of soils, effect of legumes and free-living organisms, Kans. 595.
 growth and yield, effect of insecticides added to soils, 501.
 growth, effect of irrigating soils with waste sulfate liquor, Oreg. 595.
 growth in quartz sand, effect of soil and peat admixtures, 738.
 growth substance(s)—
 applications in horticulture, 190.
 preparation and use, U.S.D.A. 46.
 research, critical study of *Avena* test and extraction methods used in, 456.

Plant(s)—Continued.

- growth substance(s)—continued.
 response, interrelation of organic materials in, 27.
 substituted phenoxy and benzoic acid, 174.
 vitamins as, 25.
 growth under controlled conditions, effect of pH on, 603.
 hormones, *see* Plant growth substances.
 house, insects infesting, Mich. 650, 784.
 hybrids, mock-dominance and hybrid vigor in, 177.
 incompatibility in, physiology, 313.
 induced evolution in, 25.
 juice, frozen, ovulating potency in rabbit, 752.
 juice preparations, orally active sex maturity factor(s) in, 91.
 kingdom, modern classification, 309.
 life, physiological activity of ascorbic acid in, 713.
 material(s)—
 gonad-stimulating, U.S.D.A. 670.
 identification, U.S.D.A. 627.
 imported for testing, U.S.D.A. 308.
 phosphorus analysis, 291.
 strategic, importation, U.S.D.A. 627.
 use as orchard cover crops, Pa. 628.
 medicinal, of Navajo Indian, 460.
 metabolism iron-manganese relation in, 645.
 mineral pattern of stems, determined by microincineration, 314.
 native, adaptability for stabilization of blowing sand areas, Tex. 25.
 nectar and pollen, Oreg. 795.
 newly introduced, testing and propagation, P.R. 629.
 nitrate content, factors affecting, 315.
 nitrogen metabolism in, end products of, 315.
 nutrition—
 and hydrogen ion, 209, 604.
 minor elements in, Oreg. 595.
 physiological studies in, 171, 744.
 zinc in, 456.
 ornamental—
 diseases, Oreg. 641.
 propagation with growth substances, Ohio 331.
 seed treatment studies, 484.
 studies, Tex. 47.
 pathology in England and Wales, organization for, 203.
 perennial, for North Carolina, N.C. 342.
 perennial, variety tests, Kans. 628.
 photosynthesis, *see* Photosynthesis.
 poisonous—*see also specific plants.*
 in Davis Mountains, Tex. 99.
 of New South Wales, 526.
 to livestock, Calif. 526, U.S.D.A. 97, 676.
 propagation by grafting and budding, Mo. 332.

Plant(s)—Continued.

- resources of Honduras, 310.
- respiration, *see* Respiration.
- salt absorption and accumulation by, biochemistry, 462.
- sand culture methods, 314.
- species, temporary establishment on Canton Island, 73.
- stand on muck soil, relation to midsummer seeding, Ohio 331.
- stems, longitudinal splits in, causes of regeneration after, 171.
- sugar in, effect of cations (K, Na, Ca) on conversion, 604.
- survey of Texas, Tex. 25.
- susceptible and resistant to root knot, 781.
- suspected toxicity, feeding tests to determine, Tex. 99.
- tanning, production of substitutes for, U.S.D.A. 627.
- tests for tannin, Tex. 25.
- tissue(s)—
 - auxin extraction from, 462.
 - carbohydrates in, determination methods, Mo. 47.
 - cultures, 463.
 - cultures, new technic in experimental science, 25.
 - rubber in, new method for determination, N.Y.State 767.
 - tests, relation to fertilizer needs, N.Y.State 191.
- transplanted, survival, effect of partial defoliation, U.S.D.A. 47.
- treatment with synthetic growth substances, Ohio 46.
- vascular, of Ohio, additions to revised catalog, 311.
- viruses and crystallography, 204.
- viruses, isolation and crystallization by hydrophilic colloids, 346.
- viruses, preserving in vitro by simplified lyophile apparatus, 210.
- viruses, purification and properties, Mo. 50.
- volunteer, ring rot in, 209.
- water culture, fertilizers for, Tex. 599.
- woody, *see* Woody.
- Plasmodium gallinaceum*, mosquito-borne, immunization of fowls against, 391.
- Platinum chloride, effect on bean and tomato, 462.
- Platynota stultana*, life history and control on carnation, 79.
- Platyopoeilus maculatus* populations, frequencies of dominant genes in, 749.
- Platyptilia* spp. of economic importance in California, 506.
- Plecoptera, North American, studies, 658.
- Pleospora* spp., new and interesting from Mt. Shasta, 601.
- Pleuropneumonia, bovine, developmental cycle of organism and related microbes, 527.
- Plodia interpunctella*, *see* Indian-meal moth.

Plow(s)—

- draft increased by pressure on landside, Pa. 688.
- value of stop-hitches for, Pa. 688.
- Plum(s)—
 - aphid, mealy, new materials for control, Calif. 788.
 - beach, composition and use, 440.
 - beach, propagation by cuttings, 339.
 - canker resistance in, varietal rating, 484.
 - curculio—
 - Jarring and dichloroethyl ether for control, 367.
 - notes, Mont. 655.
 - on peach, control, 654.
 - sprays for, Pa. 652.
 - studies, Tex. 73.
 - fertilizer tests, N.Y.State 193.
 - gouger, notes, Mont. 655.
 - juice, preparation and processing, 156.
 - Lombard, latent virosis on, U.S.D.A. 343.
 - preparing for frozen food lockers, 700.
 - variety tests, Miss. 191.
- Plume moths of economic importance in California, 506.
- Plutella maculipennis*, *see* Diamondback moth.
- Plywood for grain bin construction, 259.
- Pneumococci, bacteriostatic effect of sulfonamide drugs on, quantitative determination, 526.
- Pneumoencephalitis in poultry, studies, 824.
- Pneumonia—
 - atypical, infectious agent from, transmissible to cotton rats, 525.
 - calf, cause, and effectiveness of sulapyridine in, Pa. 676.
 - calf, etiology and pathology, 682.
 - progressive, or lung disease of lambs, Oreg. 676.
- Poa pratensis*—
 - and its hybrid, cytogenetic studies, 180.
 - nematode infestation in Nova Scotia, 209.
- Podapolipus*, acarine parasites of in South Africa, 658.
- Pogonomyrmex occidentalis*, damage to highways by, 510.
- Poinsettia, bacterial disease, 496.
- Poison ivy control by spraying, 331.
- Poisonous plants, *see* Plants, poisonous, and specific plants.
- Polarography, quantitative factors in, 5.
- Polioencephalitis, Wernicke's hemorrhagic, of man, counterpart of Chastek paralysis in foxes, 248.
- Pollen(s)—
 - composition of, 82.
 - required by colony of honeybees, 83.
- Polychrosis viteana*, *see* Grape berry moth.
- Polymers, high, synthetic and natural, textbook, 577.
- Polyploidy—
 - and relation of mitotic disturbances to X-ray dosage, 35.
 - induction in crop plants, 179.

- Polyporaceae**, transformation of basidia, moisture relation as determinant factor, 770.
- Popcorn**, hogging off, Ga. Coastal Plain 373.
- Popillia japonica*, see Japanese beetle.
- Poplar**, white, significance in Maryland, 461.
- Poppy**, white, growth and development, effect of day length, 170.
- Population**—
 adjustment to rural resources in Missouri, Mo. 124.
 and labor movements, keeping track of, U.S.D.A. 835.
 changes of incorporated hamlets and villages, size as factor in, 696.
 groups, nutrition survey, 546.
 growth in Washington, Wash. 541.
 increase rate, decrease of, Pa. 607.
 migration, interstate, and county finance in California, U.S.D.A. 840.
 migration, wartime, from rural Spanish-speaking villages of New Mexico, 843.
 rural, of Missouri, resources, Mo. 124.
- Pork**—
 changes in, during freezing and storage in frozen state, Ind. 848.
 curing and storage, Alaska 666.
 muscle, dried autoclaved, effect on pregnant rats, 273.
 production, confinement system for, 800.
 production, home, 800.
 research program in Canada, 130.
 sausage, seasoning in, Kans. 666.
- Porphyrin** nature of blood-caked whiskers of pantothenic acid deficient rats, 284.
- Portheiria dispar*, see Gypsay moth.
- Potash**—
 available to crops unless lost by erosion, Miss. 453.
 fertilization, crop response to, relation to available potassium, 453.
- Potassium**—
 absorption in soils in nonreplaceable forms, 23.
 determination in fertilizers, 7.
 fixed, availability, affected by freezing and thawing, 22.
 in animal nutrition, 134.
 quick-test technics for, 149.
 relation to soils and plant nutrition, Oreg. 595.
- Potato(es)**—
 apical leaf speck, 351.
 bacterial ring rot, diagnosis, 643.
 bacterial ring rot situation in United States, 623.
 beetle, Colorado, Nebr. 73.
 blight, early, U.S.D.A. 58.
 blight, early, in Ecuador, 351.
 blight, late—
 in Nebraska, U.S.D.A. 202.
 in Oregon, early appearance, U.S.D.A. 640.
 reports on, U.S.D.A. 58.
- Potato(es)**—Continued.
 blight, late—continued.
 situation in Upper Mississippi Valley, U.S.D.A. 848.
 studies, U.S.D.A. 58.
 blight-resistant strains, tests, Pa. 619.
 breeding, Miss. 186, Nebr. 41, Oreg. 619, U.S.D.A. 616.
 bulk handling, Idaho 259.
 bulk storage to save burlap costs, Colo. 867.
 Central and South American, for improvement of European and North American stocks, 25.
 certification work, Ga. 617.
 culture tests, Alaska 617, Mont. 610, Tex. 42.
 dehydration tests, 840.
 dehydrator for, Colo. 849.
 disease(s)—
 and insect control by breeding, 622.
 and pests in Chile, 351.
 control in Brazil, 773.
 in Panama, 643.
 in peat soils in California, survey, 63.
 in State, N.C. 485.
 main virus, in Victoria, 210.
 new, in Vincentown, N. J., symptoms, 352.
 studies, Nebr. 59.
 virus, review, 643.
 early, production, 623.
 eelworm disease, 352.
 effects of fertilizers on chemical constituents, Alaska 617.
 ✓ fertilizers tests, Alaska 617, Kans. 618, Okla. 756, R.I. 326, Tex. 42.
 ✓ fertilizers, Mich. 755.
 ✓ fertilizers, replacement of superphosphate in, U.S.D.A. 617.
 flea beetle(s)—
 control, 498.
 life history and habits in western Nebraska, 700.
 studies, Nebr. 73, Oreg. 655.
 fruit setting in, 761.
 growth and maturity, effect of treble superphosphate on, Alaska 617.
 heat and drought endurance studies, Nebr. 41.
 hollow heart, effect of foliage removal and shading, 64.
 hollow heart, histological study, 64.
 improvement, aid of exploration in, 748.
 in storage, effect of humidity and temperatures at various periods, Nebr. 41.
 inoculation tests for resistance to *Phytophthora*, 773.
 Kansas, cold storage studies, Kans. 623.
 Kansas, distribution, 623.
 Kansas, storage conditions for, 623.
 labor needs for, Mich. 755.
 late-crop, maintaining quality in retail markets, Oreg. 842.

Potato(es)—Continued.

late-crop, marketing, Oreg. 121.

leaf roll studies, Vt. 485.

leafhopper—

as alfalfa pest, U.S.D.A. 658.

as hop pest, N.Y. State 218.

feeding on apple leaves, effect on photosynthesis and transpiration, 214.

Intermountain, suggested name, 75. studies, Nebr. 73.

trap-light studies, 75.

meal, feeding value for sheep, Ga. 666

mosaic, mild forms, effects, 60.

nematode, scab, and virus problems, Oreg. 641.

net necrosis in, 644.

planting, spraying, and pH range tests, R.I. 326.

production—

and marketing in State, R.I. 394.

dusts v. bordeaux spray for, 64.

in Southern States, U.S.D.A. 189.

on Cumberland Plateau, Tenn. 44.

psyllid, notes, Mont. 655, Nebr. 73.

quality, relation to fertilization, Ohio 326.

research, 623.

resistant to leafhoppers, development of, Ohio 362.

ring rot control, results in, 488.

ring rot disease, causal agent, transmission by insects, 72.

ring rot free seed stocks, methods for selecting, accuracy, 64.

ring rot, resistance of varieties and seedling progenies to, 64.

root eelworm, cyst population of a field over a series of years, 210.

root knot control in Ecuador, 351.

scab gardens in United States, 351.

scab pathology, Vt. 485.

scab, relation to calcium, soil reaction, and fertilizers, Va. Truck 488.

scab, relation to pH of soil, 209.

scab severity, relation to fertilizers, 644.

seed, development of virus diseases in basic strains, Vt. 485.

seed piece decay, prevention, 65.

seed stock testing for virus disease, sample size and reliability, 488.

seed stocks, prevention of ring rot infection in, 623.

selection for institutions, quality and economy in, 699.

self- and cross-incompatibility in, genetic nature, 179.

sickness, effect of trace elements, 209.

sprouts for mass propagation of black scale, 504.

starch, and derivatives, uses for, U.S.D.A. 723.

starch, physical properties and relation to culinary quality of potatoes, 699.

stem end browning in, 644.

Potato(es)—Continued.

storage tests, Alaska 617, Kans. 618.

storages—

cooling, control system for, N.Dak. 392.

for Michigan, Mich. 691.

types, temperature studies, N.Dak. 259.

sugar in, factors affecting effect of CO₂ on, 44.

sulfur injury to, Tex. 73.

superior varieties or strains grown by station, Oreg. 619.

top necrosis in, strain of tuber blotch virus causing, 643.

tuber injury, La. 362.

tubers, inhibition of sprouting, 602.

Up-to-Date variety, top necrosis in, identity, 644.

varieties, Mich. 755.

varieties, combining disease resistance and high yield and good qualities, U.S.D.A. 616.

variety tests, Alaska 617, Ga. 617, Kans. 618, Miss. 325, Nebr. 41, Okla. 755, R.I. 326, Tex. 42.

virus diseases, 343.

virus-free, production in southwest England, 644.

virus X, effect on growth and yield, 210.

virus X, severity of strain mixtures in varieties, 773.

virus Y, transmission by *Aphis rhamni*, 210.

yield(s)—

and mineral content, effect of minor element compounds, 456.

effect of manure, alfalfa, and pastured sweetclover on, Nebr. 41.

in response to right fertilizers, Ohio 326.

increase by manure and fertilizer, Ohio 326.

Poultry—see also Chick(s), Chicken(s), Duck(s), Fowl(s), Hens, etc.

and egg situation outlook for 1943, Mich. 800.

artificial insemination of, Kans. 666, Minn. 184.

autopsy examinations of, R.I. 384.

blood, hemoglobin in and methods for determination, 685.

body form in, 802.

body measurements and production characteristics, effect of environment v. heredity, 37.

breeding and cross-breeding studies, N.C. 468.

breeding for meat production, Calif. 750.

breeding operations in Canada, mortality during, 248.

breeds possessing high egg production and early feathering tendencies, development of strains, Kans. 612.

cecal worm removal, efficacy of phenothiazine for, 250.

Poultry—Continued.

colds in, sulfathiazole for, 824.
 consumer demand in resort areas of western Michigan, Mich. 695.
 Cornish Bantams, growth, 802.
 cross-breeding, Kans. 320.
 crosses between inbred lines, 612.
 disease(s)—
 and parasites, U.S.D.A. 98.
 Ranikhet, vaccination against, method, 249.
 respiratory, control, 824.
 studies, Calif. 824, Kans. 676.
 transmissible, report of committee on, 814.
 dusting with hypochlorite powders, possible irritating effects, 104.
 early feathering, sex-linked, modified expressions of, 377.
 effects of thyroid and gonadotropic preparations in, 321.
 enterprise on Kansas farms, economics of, Kans. 838.
 fat, storage changes in, Kans. 666.
 fattening, methods and rations for, 88.
 feather picking prevented by fiber, Okla. 797.
 feeding, economy and efficiency, effects of feed supplements in, R.I. 379.
 feeds, farm price, 1933-38, Mo. 110.
 fertility in, seasonal variation, Mo. 84.
 freezing preservation, N.Y.State 272.
 frozen, factors affecting quality, 273.
 gains in weight and increases in fat, covariance analysis for data on, 669.
 gains of different breeds, Mo. 84.
 grass silage and modified rations for, Kans. 666.
 growth, relation to date of hatching, Mo. 84.
 handling, types of, by cooperative associations, Ohio 394.
 hatching ability, relation to eggshell texture, Mich. 237.
 house litter, problem of moisture in, N.H. 235.
 improvement in southeastern Europe, U.S.D.A. 540.
 Improvement Plan, National, changes in, U.S.D.A. 669.
 industry, economics of, Kans. 693.
 inheritance of lethal condition affecting both mandibles, 376.
 laying house, time- and labor-saving equipment for, Ohio 235.
 Leghorn, unselected, and strains bred for resistance to leukosis complex, comparative viability, 377.
 lice control, U.S.D.A. 98.
 lice, notes, 502.
 management manual, 272.
 mites, U.S.D.A. 98.
 molasses in feed of, 517.
 normal growth, Mo. 84.
 nutrition, new developments in, 514.
 nutritional experiments, 378.

Poultry—Continued.

nutritional requirements, Mo. 84.
 one mash for all ages, Miss. 231.
 parasites and treatment for removal, U.S.D.A. 676.
 pH of digestive tract, 803.
 phenothiazine v. hemoglobin, 250.
 plant protein feeds for, Pa. 667.
 production characteristics and body measurements, effect of environment v. heredity, 320.
 production, profits in, Utah 235.
 production strains, laying tests for identifying, Okla. 797.
 products, packing by freezing, U.S.D.A. 723.
 protein needs of, effect of war, N.Y.State 801.
 pulse rate, method of measuring, 801.
 rations—
 animal protein required in, 800.
 corn products and silage in, Nebr. 84.
 fiber and "bulk" in, effect on feather picking and cannibalism, 89.
 protein, replacement by soybean products, Ark. 797.
 riboflavin in, 518.
 varying amounts of vitamin D with high manganese levels in, Tex. 85.
 reproduction, effect of *Lactobacillus casei* e eluate fraction, 802.
 research program in Canada, 180.
 resistance to *Salmonella pullorum*, relation to body temperature, 377.
 results of hypophysectomy in, 377.
 Rhode Island Red, breeding for rapid feathering, Mass. 468.
 Science Association meeting, papers, 376.
 Single-Comb White Leghorn, improvement of general viability in, 376.
 sorghums and corn milling byproducts for, Nebr. 84.
 utilization of fat by, 376.
 wastes, utilization, U.S.D.A. 723.
 White Leghorn fed high and low protein rations, egg production and mortality, 377.
 White Leghorn females, lopping of combs in, 469.
 White Leghorn males, body weight, effect of different periods of illumination, 377.
 White Leghorn males, effect of dubbing, 237.
 White Plymouth Rock strains for specific purposes, 377.
 Powder-post beetles, studies, N.J. 79.
 Powdery mildew control by fungicides and resistant varieties, R.I. 344.
 Power equipment, cost of operating, Oreg. 839.
 Prairie—
 ant, mound-building, damage to highways by, 510.

- Prairie**—Continued.
 grasses, drought resistance of seedlings, 744.
 hay as source of vitamin A, Okla. 808.
 hay for dairy cattle, Okla. 808.
- Pratylenchus pratensis***—
 notes, U.S.D.A. 203.
 on citrus, 343.
- Precipitation**—*see also* Rainfall, Snow, etc.
 centuries-long tree-ring records of, 13.
 contrasts, average, in United States, 158.
 maps and regionalization of United States on precipitation basis, 445.
- Precipitinogens**, separation from bacterial spores, 457.
- Predators**, biological control, 652.
- Pregnancy**—
 prolonged, in lactating rat with oestrogen, experimental control, 40.
 relation to nutrition, 131.
- Pregnant mare serum**, purification of gonadotropic hormone in, Mo. 34.
- Pressure** in tropical regions, synchronous variations of, 159.
- Price(s)**—
 control, ancient experience with, 393.
 control program as it affects the station, Miss. 142.
 wartime, relation to work of agricultural engineers, 687.
- Pricklypear**, *see* Cactus.
- Prionus**—
californicus, *see* California prionus.
laticollis in subterranean wooden duct for telephone cables, 362.
- Pristiphora* spp.**, development after hibernation in cocoon, effect of temperature, 229.
- Production**, prices, and income, index numbers, Ohio 110.
- Profenusa canadensis***, notes, N.Y.State 785.
- Progesterone** effect on pituitary lactogen and on mammary glands of ovariectomized rats, 753.
- Prolactin**—
 assay, methods for, 91.
 studies, 725.
- Prospaltella* spp.**, effect of dormant sprays on, 510.
- Protein(s)**—
 and allied substances, effect of light on, N.Y.State 149.
 cellular, dissociations by auxins, relation to growth, 27.
 hydrolyzate, new color test for tryptophan in, 730.
 hydrolyzates, hydroxylysine in, 587.
 hydrolyzates, preparation of amino acids from, 581.
 macromolecules, isolation and crystallization by hydrophilic colloids, 346.
 molecules, electron micrographs of, 746.
 nitrogen, determination by Kjeldahl method, effect of nitrates, 587.
 studies with casein-aldehyde plastics, N.Y.State 149.
- Protein(s)**—Continued.
 supplements, relative efficiency for ruminants, 513.
- Proteus vulgaris***, production of active and inactive catalase by, 458.
- Protoparce sexta***, *see* Tobacco hornworm.
- Protoplasmic streaming**, effect of auxins, 312.
- Protostrongylus* spp.** infesting bighorn sheep, Wyo. 245.
- Protozoan parasites**, studies, Kans. 676.
- Provitamin A carotenoids**, assays of, 9.
- Prune**—
 dwarf, 69.
 fruit, russet and protuberances on, 357.
 Italian, pollination, 339.
 Sugar, blossom bud differentiation, effect of deflorating or defruiting, 339.
 thrips control, Oreg. 655.
 worm, destructive in Idaho, Idaho 224.
- Psallus seriatus***, *see* Cotton flea hopper.
- Pseudananas* genus**, taxonomic study, 25.
- Pseudaphycus utilis***, parasite of coconut mealybug, P.R. 655.
- Pseudocentera mali***, notes, N.Y.State 785.
- Pseudococcus***—
sacchari, experiments with, 658.
saccharicola, life history and blonemics, 658.
- Pseudomonas-Phytomonas* fluorescent bacteria** in soil, activity, 61.
- Pseudomonas putrefaciens***—
 characteristics, distribution, and taxonomy, 240.
 in dairy products, 239.
- Pseudorabies**, *see* Paralysis, infectious bulbar.
- Psila rosae***, *see* Carrot rust fly.
- Psittacosis***—
 in chickens cause of human infection, 686.
 in pigeons and relation to human pneumonitis, 678.
 studies, U.S.D.A. 98.
- Psittacosislike* infection** in domestic and game birds of Michigan, 251.
- Psocids** on milled rice, U.S.D.A. 73.
- Psylla pyricola***, *see* Pear psylla.
- Psyllidae**, new, from Puerto Rico, P.R.U. 222.
- Ptinus californicus*** in insect nests, 73.
- Public welfare** in Michigan, reorganization, Mich. 125.
- Puccinia***—
allii-phalaridis, biological study, 647.
phyllostadiæ, new record for India, 204.
- Puerto Rico Federal Station** notes, 288.
- Puerto Rico Station** report, 720.
- Puerto Rico University Station** notes, 429.
- Pullet(s)**—
 disease, choleralike, Mich. 248.
 growth rate, relation to production characteristics and viability, 377.
 pastures for, 377.
 respiratory-nervous disorder in, 104.
 Rhode Island Red, feeding methods and rations, Ohio 516.

Pullet(s)—Continued.

White Leghorn, calcium and phosphorus requirements, 377.

Pullorum—

agglutination test, Kans. 676.

disease—see also *Salmonella pullorum*.

antigens, U.S.D.A. 676.

eradication, Mass. 249.

rapid whole blood agglutination test for, 826.

serum agglutination test, drawing blood samples for, Oreg. 825.

Pullorumlike disease in poultry, 249.

Purchasing, local government, savings in, Tex. 111.

Purdue University notes, 427.

Purines, fermentative decomposition by *Clostridium* spp., 583.

Purple scale on citrus, effect of magnesium deficiency on infestations, 77.

Pyrausta nubilalis, see Corn borer, European.

Pyrethrins in fly sprays, activators for, 498.

Pyrethrum—

and rotenone, relative toxicity to *Ornithodoros moubata*, 664.

substitute, need for, 657.

toxicity, determining, quantitative interaction of spray fluid and active principle, 654.

v. roaches, 221.

Pyridine and nicotinic acid, 732.

Pyridoxin—

deficiency associated with convulsive syndrome in rats, 559.

deficiency in rats, pathology and histology of, 418.

deficient rats, occurrence of fits in, 558.

effect on appetite and growth of rat, 558.

effect on urinary excretion of new fluorescent substance, 280.

in honey of different localities, 551.

in wheat and wheat products, 557.

increase in germinating seeds, 313.

metabolite physiologically active in natural products, 712.

nutrition of lactic acid bacteria, 458.

paper on, 705.

storage in rat, 859.

Pyrimidine—

analog of thiamin and growth of fungi, 312.

stimulating yeast fermentation in blood cells and urine of normal humans, measurement and metabolism, 415.

Pyrroline and pyrrolidine derivatives action on firebrat, 365.

Pyruvate—

dissimilation by pigeon liver accompanied by fixation of carbon dioxide, 583.

metabolism by liver from pantothenic acid- and biotin-deficient rats, 859.

Pyruvic acid—

in blood and cerebrospinal fluid, variations in, 416.

removal from human blood in vitro, 280.

Pythiomorpha gonapodyides growth, relation to pyrimidine analog of thiamin, 313.

Pythium—

root rot of grasses, 206.

spp. from dead roots of orange and lemon, Calif. 495.

ultimum on peas, N.Y.State 66.

vesans on avocado, Calif. 494.

Q fever—

epidemiology of, 525.

epidemiology, role of cow in transmission of human infection, 244.

Quail—

bobwhite, protein requirements for survival, growth, and efficiency of feed utilization, 361.

pairing responses to sex hormone pellet implants, 322.

Study Association, Cooperative, reports, 653.

Quarantine adjustments considering biological findings, 500.

Quercus species of Central America, U.S.D.A. 201.

Quince, Japanese, use as food, 296.

Quinoa anatomy and chemical composition, 315.

Quinqueserialis quinqueserialis, life history studies, 230.

Rabbit(s)—

adequacy of simplified diets for, 549.

attempts to modify sex ratio in, 610.

blood enzyme, atropinesterase, inheritance of, 750.

broad-leaved milkweed poisonous to, 248.

cottontail, body weight and sex ratio, 360.

cottontail, home range, 360.

degenerative disorder of nervous system designated ataxia, 36.

effect of feeding coffee grounds to, 235.

extrauterine pregnancy in, 753.

mammogen and unilateral mammary gland growth in, 470.

New Zealand white, pituitary weight, relation to live weight, 183.

raising, 497.

tick, seasonal history in Oklahoma, 664.

Rabbitbrushes, rubber from, N.Dak. 624.

Rabies—

diagnosis and prevention, 390.

experimental, treatment of wounds in, 814.

report of committee on, 814.

viruses, plurality in, Venezuela, 390.

Radish—

Fusarium wilt, 355.

Induced formation of β -glucoside in, 172.

Raillietina cesticillus—

in poultry, nutritional requirements, 249.

studies, Kans. 676.

Rain, heavy summer, effect on soil losses from cultivated land, N.C. 446.

Rainfall—see also Precipitation.

and runoff from watersheds of Missouri, compilation, U.S.D.A. 594.

and runoff in Santa Cruz River drainage basin, Ariz. 445.

Rainfall—Continued.

- at State College in 1942, driest year in 54-year record, Miss. 736.
- distribution over surface of unlevel ground, factors governing, 158.
- effect on mineral composition of forage, Okla. 756.
- effect on soil crust formation, Okla. 737.
- evaluation as aid to irrigation interval control, 13.
- heavy, in New Mexico and Arizona, characteristics, 736.
- interception, effect of cutting mature lodgepole pine stands, 639.
- of varying duration, intensity-frequency, 593.
- papers on, 445.
- runoff, and soil loss from Little La Crosse River and Coon Creek Watersheds, U.S.D.A. 736.
- runoff, and soil loss from South Fork Palouse River, U.S.D.A. 736.
- spring, in United States and sunspot period, 593.
- tabulated data, Ga.Coastal Plain 299.
- Ramie fiber, present situation in, 286.
- Ramularia* spp., new and interesting from Mt. Shasta, 601.
- Rancidity in milk, prevention, 674.

Range(s)—

- condition, guides to determine, U.S.D.A. 327.
- conditions, improving for wartime livestock production, U.S.D.A. 620.
- improvement, conservation of flood water for, Mont. 688.
- land, destruction of cacti on, 506.
- lands, Montana, reseeding to increase yield, U.S.D.A. 757.
- livestock industry, problems and policies facing, 536.
- management and burning, U.S.D.A. 665.
- management, effective, appraisal of range survey methods for, U.S.D.A. 326.
- national forest, important plants on, U.S.D.A. 327.
- regrassing for soil protection, U.S.D.A. 756.
- reseeding for increased feed supplies, Utah 187.
- reseeding tests, Utah 620.
- sagebrush-grass, forage improvement on for increased wartime meat production, Colo. 757.
- subalpine grassland, basis for judging, U.S.D.A. 43.

Raphanus—

- polyploid forms, self-incompatibility in, 317.
- raphanistrum* as breeding host of green peach aphid, 499.

Rapid plant bug studies, Tex. 73.**Raspberry (ies)—**

- breeding for South, 627.
- Cuthbert, crown degeneration, Oreg. 641.
- decline disease, 777.
- diseases, control, N.Y.State 203.

Raspberry (ies)—Continued.

- fertilizer requirements, N.Y.State 193.
- fruitworm, notes, Mont. 655.
- Milton, new variety, description, N.Y. State 196.
- mosaic, mild forms, effects, 60.
- phosphorus and calcium in, 133.
- production, Mo. 339.
- root-borer, notes, Mont. 655.
- soils of British Columbia, 196.
- variety tests, Ga. 627.

Rat(s)—see also Rodent(s).

- androgen production during pregnancy and lactation, 321.
- antigraying factor for, Ohio 409.
- appetite and growth, effect of deficiencies of vitamin B group, 558.
- calcium and fat utilization, interrelation, 132.
- convulsive syndrome in, due to pyridoxin deficiency, 559.
- feeding carotene products to, results, 234.
- female, effect of postnatal androgenic treatment, 39.
- flea, oriental, in Kansas, 510.
- hermaphroditic, anatomy of, 36.
- hypophysectomized, effect of oestrin implants on tibia, 183.
- inbred, vitamin A requirements, relation to genetic factors, Tex. 35.
- intact and castrated female, masculine copulatory behavior in, 614.
- interlitter and intralitter variation in as response to vitamin D, 284.
- lactating, basal energy metabolism, Mo. 92.
- on pantothenic acid-deficient diet, nature of reddish material on nose and whiskers, 284.
- on synthetic diet, effect of substitution of bicarbonate for chloride in, 134.
- oviducts and egg transport in, 752.
- parabiotic, effect of oestradiol on secretion of gonadotropic hormone in, 321.
- parallel embryonic development in and relation to superfetation, 470.
- suckling, selection of nipples by, effect on mammary system, 471.
- Vitamin B₆ complex-deficient, red staining of paws and whiskers in, 566.

Rationing—

- bibliography of, U.S.D.A. 111.
- wartime, in Elre, U.S.D.A. 540.

Raven, white-necked, relation to agriculture, 653.**Rayon—**

- how to sell and care for, 865.
- production in first six months of 1942, 572.
- yarns, plastic-coated, 572.

Red mite—

- control, 512.
- European, control, Conn.[New Haven] 499.
- European, control, tank-mixed oil sprays for, N.Y.State 785.

Red mite—Continued.

European, early season v. summer control, 363.

Red scale—**California—**

Comperiella bifasciata as parasite, 796.

laboratory fumigations, 366, 789.

protective stupefaction of, 782.

resistant and nonresistant strains to fumigation with HCN, 788.

resistant and nonresistant strains to methyl bromide, comparison of susceptibility, 76.

spray-fumigation experiments, 789.

stupefaction with sublethal dosages of hydrocyanic acid, 76.

toxicity of trichloroacetonitrile to, 72.

control, fumigation in, 659.

difference in two races and relation to tolerance to HCN, 788.

Florida, Tex. 73.

parasites, oriental races in California, comparison, 664.

Red spider—

control on lima beans, N.Y.State 785.

control on strawberries, new practice for, La. 362.

on alfalfa in greenhouse, new organic insecticides for, 782.

studies, Ark. 72, Kans. 655.

Redwood—

crown gall, 359.

cut-over lands, natural restocking, 201.

Reed canary grass for pasture and hay, seed-ing practices and seeds, N.J. 187.

Refrigerator, farm milk, dual motion develop-ment in, 257.

Reindeer compared with domestic animals as to fattening, sex, and increase, 86.

Relay, simple photoelectric, description, 177.

Rennin, crystalline, preparation, 813.

Reproduction and lactation, effectiveness of linoleic, arachidonic, and linolenic acids in, 859.

Resazurin test, paper on, 520.

Research—see also Agricultural research.

analysis, cross-sectional and case-group-ing procedures in, 693.

Reservoirs—

evaporation from, 736.

in Trinity River Basin, sedimentation in, relation to land use, Tex. 106.

stratified flow in and use in prevention of silting, U.S.D.A. 532.

Resins—

stable, from pine gum, U.S.D.A. 723.

synthetic, from lactic acid, intermediates for, U.S.D.A. 723.

Respiration in virus-infected plants, 769.

Rhagoletis—

cingulata, see Cherry fruitfly.

pomonella, see Apple maggot.

Rhizobium—

cultures for inoculating alfalfa in Ar-gentina, 312.

japonicum, persistence in soil, 166.

Rhizoctonia—

mucoroides, mycorrhizal associate of *Zeus-inc stratumnatica*, 27.

soil-borne, prevalence, effect of environ-ment, 351

solani, notes, 63.

solani on peas, N.Y.State 66.

solani, single basidiospore isolates, cul-tural differences, 770.

Rhizopertha dominica, see Grain borer, lesser.

Rhizopus—

pattern, 486.

suinus, carbohydrate nutrition of, 31.

Rhode Island College notes, 429.

Rhode Island Station notes, 429.

Rhode Island Station report, 426.

Rhopalosiphum pseudobrassicac, see Turnip aphid.

Rhopalothrips bicolor, notes, 72.

Rhubarb, ascorbic acid in, 559.

Ribes alpinum, formation of adventitious roots, 457.

Riboflavin—

and thiamin deficiencies, relation, Ark. 845.

and turkey egg hatchability, Pa. 667.

bibliography supplement, 417.

deficiency in chick, genetic resistance to, 749.

deficiency, succinoxidase system of rat liver in, 856.

effect on appetite and growth of rat, 558.

fate of on baking, 151.

history and properties, 374.

in citrus fruits, 856.

in common foods, 557.

in defatted milk solids, 674.

in foodstuffs, fluorimetric estimation, 591.

in fruits and vegetables, determination, 437.

in honey of different localities, 551.

in poultry rations, 518.

in prepared foods, 281.

in urine and tissues of rats, fluorimetric assay, 710.

in urine, fluorimetric estimation, 591.

in wild rice, 857.

Increase in germinating seeds, 313.

metabolism in American cockroach, study by fluorescence microscopy, 658.

microbiological assay for, growth stimu-lants in, 734.

microbiological method for, 438.

of various products, Mass. 798.

papers on, 705.

pure, use in poultry mashes and con-centrates, 804.

relation to cataract formation in rats, 417.

report on, 733.

- Riboflavin**—Continued.
 requirement of turkeys for hatchability and growth, 376.
 solutions, effect of light on, 734.
- Ribonuclease**, crystalline, ultraviolet absorption spectrum, 585.
- Rice**—
 and rice milling products, thiamin in, Ark. 845.
 blast, varietal resistance, Ark. 769.
 breeding, Ark. 755, Tex. 42. U.S.D.A. 616.
 carriers of N and P for, Tex. 42.
 culture tests, Tex. 42.
 disease-resistant varieties, U.S.D.A. 616.
 diseases, Tex. 69.
 drier, farm-sized, description, Ark. 833.
 fertilization, Ark. 40.
 fertilizer tests, Tex. 42.
 fertilizers, methods of applying, Tex. 42.
 field mosquitoes, control, Ark. 783.
 irrigation, water resources for, Ark. 106.
 leaf spot fungus races and subraces, 642.
 moth on milled rice, U.S.D.A. 73.
 physiological studies, Tex. 25.
 polishings, use in cooking, Lau. 700.
 prices paid Arkansas farmers, comparisons, Ark. 270.
 proteins, digestibility and biological and supplemental values, Ark. 845.
 respiration, fermentation, and growth, effect of oxygen tension, 745.
 stinkbug as sorghum pest, 783.
 stored, insect pests, control, U.S.D.A. 73.
 tolerance to different soil reactions, Tex. 42.
 transplanted and direct sown, comparative yields, 623.
 variety tests, Ark. 755, Tex. 42.
 weevil, mineral oils and tar oils for, 217.
 weevil studies, U.S.D.A. 73.
 yield, effect of green manure, Ark. 755.
- Ricinus communis***, development of node in, 465.
- Rickettsia***—
conjunctivae infection, epidemiology of, 528.
dermacentrophila n.sp., description, 242.
Rictularia sp., parasite of squirrel, 497.
- Rinderpest**, transmission experiments by *Tabanus orientis*, 244.
- Rirea corymbosa***, history, nomenclature, and composition, 601.
- River stages**, daily, at gage stations, 299.
- Road burdens and services in rural towns**, N.H. 400.
- Robin**, nesting habits, 654.
- Rocky Mountain spotted fever tick** and tularemia in sheep, 102.
- Rodent(s)**—*see also* Mice and Rat(s).
 and mosquito control, Conn.[New Haven] 499.
 biological control, 652.
 wild, granuloma in lungs of, spontaneous coccidioid, 391.
- Roentgen rays**, *see* X-ray.
- Root knot**—
 chemical control, 484.
 nematode—
 in high ridge plantings of potatoes and tomatoes, 484.
 larvae populations in special areas, 484.
 reaction of commercial cotton varieties to, 484.
 on plants, effect, Ga.Coastal Plain 344.
- Root nodules**, *see* Nodule bacteria.
- Root parasitism**, anatomical study, technic for, 204.
- Root stimulants**, Tex. 599.
- Roots**, entry of water into, device for measuring, 463.
- Rose(s)**—
 black spot control in commercial plantings, R.I. 344.
 bushes, effect of pruning on bloom production, 55.
 diseases, Tex. 60.
 effect of soil reaction, Ohio 331.
 hip sirup, vitamin C in and stability, 862.
 hips, vitamin C in, 714, Conn.[New Haven] 127.
 hybrid, understock resistant to nematode, 496.
 in greenhouse, soil management, Wash. 767.
 in storage, effects of growth-regulating substances on shoot development, 341.
 in storage, prevention of shoot development on, 637.
 plants, storage, Oreg. 628.
 powdery mildew control in commercial plantings, R.I. 344.
 powdery mildew control in greenhouse, [N.Y.]Cornell 358.
 understocks, susceptibility to nematode root knot, U.S.D.A. 58.
- Rosin products to replace scarce ones**, U.S.D.A. 723.
- Rotation of crops**—
 Miss. 326, Mo. 15, Nebr. 41, R.I. 326.
 on dry land and under irrigation, Mont. 619.
- Rotenone**—
 analytical isolation from spray solution, 72.
 and pyrethrum, relative toxicity to *Ornithodoros moubata*, 664.
 dusts, carriers of, 365.
 dusts, increased toxicity with, 657.
 elaboration, effect of nutritional levels on, 463.
 lower concentrations, 221.
 producing crops, culture and physiology of, P.R. 629.
- Roughages**, carotene content, reflected in milk, Ohio 380.
- Roundworm parasites of cattle**, U.S.D.A. 98.
- Royal jelly and bee bread**, vitamins in, 82.
- Rubber**—
 analysis of plants in South Carolina, 31.
 bacterial oxidation, 309.
 bacterial oxidation, prevention, 778.

Rubber—Continued.

- from *Castilla*, U.S.D.A. 768.
- from milkweeds and other plants secreting latex, N.Dak. 623.
- guayule, production under irrigation, 637.
- Hevea*, cultivation in tropical America, 25.
- native plants as possible sources, N.Y. State 767.
- plant, Colorado, rubber from, N.Dak. 624.
- sources, tests of potential plants as, U.S.D.A. 627.
- substitute Norepol, U.S.D.A. 723.
- synthetic, from lactic acid, intermediates for, U.S.D.A. 723.
- synthetic, intermediates, U.S.D.A. 723.
- synthetic, research on, U.S.D.A. 723.
- tree (*Hevea*), selection and propagation of high-yielding resistant strains of, U.S.D.A. 627.
- tree leaf blight, control by crown budding, U.S.D.A. 341.

Rubidium bromide, absorption and accumulation by barley plants, 173.

Rubus—

- new dwarf species and Asiatic relatives from China and Tibet, 169.
- single-bud stem cuttings, rooting, use of mist spray in, 627.

Ruminants—

- digestibility studies, 232.
- rumen gases and bloat in, Oreg. 676.

Runoff—

- and percolation studies of soil types of Illinois, 450.
- forecasting in Humboldt Basin, Nevada, 300.
- water, velocity, method for determining, 828.

Rural—**community(ies)—**

- in transition, Va. 124.
- Landaff, N. H., culture of, U.S.D.A. 271.
- of Cumberland Co., local leadership in, Tenn. 844.
- of New York, effect of status on attitudes in, [N.Y.]Cornell 543.
- Old Order Amish of Lancaster Co., Pa., culture of, U.S.D.A. 271.
- Sublette, Kans., culture of, U.S.D.A. 406.
- credit, *see* Agricultural credit.
- cultural conflict and acculturation in southern Brazil, 843.
- education in, United States, 543.
- Electrification Administration, report, U.S.D.A. 830.
- housing in the South, 608.
- labor, *see* Farm labor.
- life, changes in, effect of the war, 697.
- life, satisfaction in, attempt to measure, 697.
- living, changes in, survey, U.S.D.A. 718.

Rural—Continued.

- population in Tennessee, nutrition of, 132.
- population, social well-being of, factors affecting, Kans. 697.
- youth group of Randolph Co., Ill. 542.
- youth of Ross Co. level of living and social achievement, Ohio 698.
- Rhus* sp., unusual development of fruit bodies, 27.
- Rust mite on pears, control, Oreg. 655.
- Rusts, parasitization in Kansas, U.S.D.A. 58.
- Rusts, tropical American, revisionary studies, 612.
- Rutabagas, vitamin B deficiency in, R.I. 326.
- Rye—
 - cold resistance, factors affecting, Nebr. 41.
 - culture tests, Mont. 619.
 - haploid, meiotic mechanism of, 35.
 - milling products, vitamin E in and effect of bleaching, 715.
 - variety tests, Ga. Coastal Plain 325.
- Ryegrass, new cover for vineyards, N.Y. State 186.
- Saccharic acids, identification as benzimidazole derivatives, 725.
- Saccharomyces* on dates, 358.
- Safflower
 - culture tests, Tex. 42.
 - irrigation tests, Tex. 42.
 - production tests, Kans. 618, Tex. 42.
 - variety tests, Nebr. 41.
- Sagaritis pruvancheri*, parasite of tobacco budworm, 783.
- Sage, propagation by cuttings, 631.
- Saintpaulia ionantha* ring spot, cause, 649.
- Saissetia*—
 - hemisphaerica*, *see* Hemispherical scale.
 - oleae*, *see* Black scale.
- Salicylates, fungicidal value, 346.
- Salicylic acid from naphthalene by bacterial oxidation, Pa. 583.
- Salmon—
 - canned, bacteriological survey, 700.
 - canned, production of staphylococcus enterotoxin in, 409.
 - cheek quality as affected by freezing and storage, Oreg. 579.
- Salmonella*—
 - donariensis* suggested name for new *Salmonella* type, 246.
 - choleraesuis* in swine, nicotine acid for prevention, 108.
 - choleraesuis* var. *kunzendorf*, somatic antigens of, 526.
 - control in foods, 408.
 - cultures, serological identification, Ky. 817.
 - genus, coliform bacilli serologically related to, 388.
 - infections in pigs, 529.
 - organisms, serological type determination, 678.

Salmonella—Continued.pullorum—*see also* Pullorum disease.

resistance of chicks to, effect of X-ray treatments, 531.

species, evolution and description of unusual type, 526.

spp. in intestines of chickens, isolation and pathogenicity, 387.

spp. in turkey poults, 105.

types, new, with related specific antigens, 251.

San Jose scale—

control on apple, effect of summer sprays, N.Y.State 785.

parasites, effect of dormant sprays on, 510.

Sand—

areas, blowing, stabilization, adaptability of native plants for, Tex. 25.

dunes, coastal, in Pacific Northwest, control, U.S.D.A. 450.

hill areas, range studies in, Nebr. 42.

Sandbags, prolonging life of, U.S.D.A. 688.

Sanninividea—*cattiosa*, *see* Peachtree borer.*opalescens*, *see* Peach borer, western.**Sarcophaga misera** as transmitter of *Endamoeba histolytica*, 370.**Sarcophagidae**, Hawaiian, 227.**Sarcoptes scabiei**, *see* Itch mite.**Sardines**, canned, quality, volatile fatty acidity as index, 150.**Sauerkraut**—

acceptable for Government purchase, production, 295.

dehydration, 545.

dried, made into bricks freed from air in new packaging process, N.Y.State 850.

factories, heating, when, how, and why, 295.

Sausage-casing material, Visking, action on bacterial growth, 291.**Sawfly**—

infestations in Pennsylvania, 664.

wheat stem, notes, Mont. 655.

Scabies—*see also* Mange.

eradication, U.S.D.A. 676.

parasitology, quantitative aspects, 654.

transmission and development, 654.

Scale insect(s)—*see also* Black scale, Purple scale, and Red scale.

armored, status of friendly fungus parasites, 223.

control by predators, P.R. 655.

dormant sprays for, Miss. 479.

on coffee in Puerto Rico, relation to ants and other organisms, P.R.U. 223.

on ponderosa and Jeffrey pines, seasonal history, 224.

Schaefferia to *Smilax*, host-parasite checklist revision, U.S.D.A. 58.**Schizosaccharomyces pombe** dead cells, absorption of neutral red by, as index of toxicity of bacterial antibiotic substance, 600.**Schizura conchina**, *see* Caterpillar, red-humped.**School(s)**—

high, students of classes of 1934-41, occupational roles 6 months after graduation, Wash. 542.

lunch for improving diets of high school students, 547.

milk program of Agricultural Marketing Administration, U.S.D.A. 128.

Science, contribution to food preparation, 272.**Scirpophaga rhodoproctalis**, natural enemy of, 793.**Scirtothrips citri**, *see* Citrus thrips.**Sclerospora macrospora**, cause of oat downy mildew, 348.**Sclerotinia sativa** on alfalfa and sweetclover, varietal resistance to, 349.**Sclerotium**—*bataticola* on sorghum, Tex. 60.*rhizodes* on grasses, U.S.D.A. 58.*rolfsii*, interaction with thiamin, 602.*rolfsii*, notes, Tex. 60.**Scobicia declivis**, *see* Lead-cable borer.**Scolytus**—*multistriatus*, *see* Elm bark beetle, smaller European.**Scours**, treatment, sulfaguanidine in, Pa. 676.**Screwworm**—

and blowfly problem, U.S.D.A. 97.

fly, newly introduced pest, Mont. 652.

infestation, factors predisposing animals to, 794.

larvae, ants as predators, 795.

larvae development in carcasses, 817.

secondary, as transmitter of *Endamoeba histolytica*, 370.

secondary, seasonal distribution, 81.

Scurvy in guinea pigs, activity of alkaline serum phosphatase, 569.**Seaweeds** at Beaufort, N. C., as source of agar, 174.**Sediment** transported by aqueous and atmospheric density currents, kind and quantity, 449.**Seed(s)**—

activities of grain inspection laboratory with, Mont. 619.

certification a national asset, 484.

certification, opportunities in, 484.

dormant, mitotic disturbances induced in, relation to X-ray dosage, 35.

germinating, increase of B vitamins in, 313.

germination, effect of seed-borne microorganisms on, 484.

germination, inhibition of, 174.

germination studies, 46.

inspection, Ky. 330, Vt. 330.

inspection and testing, N.Y.State 762.

official samples, merits and characteristics, N.Y.State 190.

stocks of 1942, N.Y.State 186.

tests, N.H. 476.

Seed(s)—Continued.

treatment—

and war needs, N.Y.State 771.

tests in laboratory and field, N.Y. State 203.

with synthetic growth substances, Ohio 46.

weed, *see* Weed seeds.

Seedbed preparation studies, Tex. 42.

Seed-corn maggot, notes, Mont. 655.

Seedlings from X-rayed seeds, auxin and calines in, 743.

Selection—

artificial, progress with, 469.

experiment, new extreme variants in, 749.

on family basis, results to be expected from, 610.

Selenium—absorption by corn from *Astragalus* extracts and solutions containing proteins, 173.

compounds, chemistry and toxicity and problem in agriculture, 579.

content of vegetation and mapping of seleniferous soils, 454.

indicator species of *Astragalus*, identification, 31.

soluble, in soils and availability to plants, 308.

toxicity, factors affecting, 527.

Selenothrips rubrocinctus, *see* Thrips, red-banded.**Semen**—

smears, preparation, effect on abnormal types of spermatozoa, 184.

stallion and jack, dilutors for, 614.

storing, packaging, and shipping, 90.

swine, rabbit, and poultry, collection and storage, Mo. 34.

Semimicronitrometer, du Pont type, 730.

Sepicemia—

hemorrhagic, U.S.D.A. 97.

paratyphoid, in horses, 529.

Septoria—

leaf spot on celtuce, U.S.D.A. 640.

tycopernica on tomatoes, control, 648.

spp., new and interesting from Mt. Shasta, 601.

Septosperma rhizophidii n.g. and n.sp., description, 486.**Sericea**—

as silage and hay crop, 185.

correct time of cutting for good hay, N.C. 473.

effect on soil fertility, 185.

in crop rotations, 184.

seeding rate, 185.

Serine—

dietary, effect on liver lipids of rats, 703.

in proteins, liability toward alkali and its consequences, 582.

Sesame production tests, Kans. 618.

Sewage sludges, chemical composition, N.J. 738.

Sex of progeny, genetic constitution of mother as means of predetermining, 749.

Sex, predetermination in *Drosophila melanogaster*, 612.

Shad oil, vitamins A and D potency, 706.

Shark-liver oil—

and vitamin A potency of milk, 673, 807.

effect on milk and butterfat production, 809.

vitamin D in 798.

Sheep—*see also* Ewe(s) and Lamb(s).

and cattle, rotation on pasture as aid in parasite control, Ohio 383.

and goats, crosses between, cytological studies, Tex. 35.

artificial insemination with fresh and stored semen, 324.

black disease in, vaccination against, Mont. 670.

breeding, Mont. 666.

breeding for Georgia conditions, Ga. 611.

breeding, management, and judging, 230.

clean fleece weight estimation from unscoured fleece weight and staple length, 513.

cobalt deficiency in South Australia, 389.

cobalt deficiency symptoms in, efficacy of cobaltized salt for prevention, 389.

cross breeding and reproduction studies, U.S.D.A. 800.

cross-breeding for lamb and wool production, Wyo. 181.

Deccan, breeding, wool quality as basis of individual selection in, 611.

diseases and parasites, U.S.D.A. 98.

diseases, control, Kans. 389.

effect of stilboestrol on sperm production, 615.

enzootic ataxia and copper deficiency, 389.

fattening on alfalfa, 375.

fertility in, hormonal augmentation of, 616.

fertility in, seminal changes in rams affecting, 615.

fine wool, selection for polled character in, Tex. 35.

fineness of wool and mohair, relation to age, Tex. 85.

fleece worm infestations, treatment, 820.

foot rot in, Mont. 678.

gastrointestinal parasites, best control for, Ohio 383.

grazing logged-off land with, Oreg. 666.

grazing methods on bromegrass-alfalfa pastures, Nebr. 42.

grazing on *Phalaris tuberosa*, staggers syndrome in, 528.

grazing preferences, Nebr. 42.

herds of the station, N.Dak. 373.

hybrid vigor in, 318.

livers, hard yellow, Tex. 99.

Merino, blowfly strike of breech, relation to tail length, 217.

Merino, of Australia, "density" and related characters of fleece, 799.

Sheep—Continued.

nematode larvae, differentiation, preparation and examination of fecal cultures for, 217.

nematodes in pasture, survival, 389.

on bitterweed ranges, maintenance, Tex. 85.

parasites and treatment for removal, U.S.D.A. 676.

parasites, control, Ga. 682.

parasitic worms of, control, 389.

permanent marking and tattooing, U.S. D.A. 665.

Rambouillet—

and Romney, and crosses between, inheritance of fiber characteristics, Tex. 35.

clean wool yield variation among regions of, 513.

fiber density of fleeces, 513.

inheritance of skin folds on, Tex. 35.

range, blood phosphorus, U.S.D.A. 665.

range methods for, Mont. 666.

range, phenothiazine medicated pellets for, 103.

range, weanling and yearling fleece characters, relation, 233.

rations for wintering, Alaska, 666.

stomach, nodular, and tapeworms in, comparative damage, Mo. 99.

stomach worm, heavy infections, fatalities from, 381.

strivey wool indicative of copper deficiency, 86.

urinary calculi in, 389.

vitamin A and carotene requirements, 798.

vitamin A requirements, Tex. 85.

wheat as feed for, Utah, 667.

worm burden, on improved and unimproved hill pastures, 821.

Sheets, four classes, service study, 423.

Shellfish, analyses, Me. 545.

Shelterbelt—

plants at North Platte Substation, effects of November freeze, Nebr. 47.

seedlings, transplanting methods to increase survival, Mont. 628.

Shigella infections, ants as probable agents in spread, 371.

Shrubs—

effects of November 1940 freeze, Kans. 628.

for shelterbelt uses, tests, Mont. 628.

native, identification and landscape uses, Miss. 342.

propagation, Mo. 47, Okla. 763.

propagation by seed, Okla. 194.

Silage(s)—

alfalfa, U.S.D.A. 670.

bluegrass-molasses, alfalfa-molasses, and corn, digestible nutrients in, 514.

corn, and grain rations, U.S.D.A. 670.

corn, vitamin A and carotene values, U.S.D.A. 670.

costs of, Mo. 110.

Silage(s)—Continued.

grass, evaluation as succulent feed, 519.

grass, for West Virginia, W.Va. 473.

grass, preservation studies, Pa. 671.

laboratory, electrode potentials in, 374. of various kinds, use for feeder calves, Ark. 797.

small grain-legume mixture, N.C. 520.

soybean feeding to helpers, N.C. 473.

Silica in soil extracts, determination, 150.

Silks, effect of sodium thiosulfate and sodium hydrogen sulfite on, 286.

Silos, moisture drainage from, methods, 535.

Silver sprays, composition and field performance, 345.

Silviculture, American, and silvics, 638.

Sinusitis, infectious, in turkeys, Ore. 676.

Sires—see also Bull(s).

Holstein-Friesian, proved, dam-daughter comparison of daughters, 610.

in serve on dairy herds at N. D. A. C., N.Dak. 720.

Sisal plantings in Haiti, Cuba, and Mexico, U.S.D.A. 617.

Sitona cylindricollis, notes, Mont. 655.

Sitophilus oryza, see Rice weevil.

Sitotroga cerealella, see Angoumois grain moth.

Skim milk—

acid-precipitated casein from, methods for manufacturing, U.S.D.A. 96.

in swine rations, Ark. 83.

odor produced by *Pseudomonas putrefaciens* in, 239.

Skrjabinema parva, notes, 384.

Skrjabinoptera—

genus, present knowledge and world host list and key, 654.

phrynosoma, redescription, 654.

Slime control, materials recommended for, relative toxicity, 154.

Snail, brown, control in citrus orchards, 72.

Snakes—

of United States and Canada, field book, 217.

venomous, Central American records and snakebite accidents, 218.

Snapdragon(s)—

cytological studies, N.Y.State 193.

diploid, colchicine induced univalents in, 467.

new pest of, 362.

tetraploids, sterile intra- and fertile intervarietal, comparative cytology, 609.

tetraploidy induced by sanguinarine hydrochloride, 180.

Snow—

and ice, papers on, 445.

Conference, Central, papers, 14.

cover and stream flow in Colorado, correlation, 299.

melt, prediction of stream flow from, 445.

perennial, and glaciers, 736.

sampling tubes, tests, 300.

Snow—Continued.

- storage and melting, effect of openings in young lodgepole pine forest, 343.
- survey, Mont. 688.
- survey tubes and accessories, canvas case for carrying, 300.
- surveys and irrigation water forecasts—
 - for Colorado River Drainage Basin, Colo. 736, U.S.D.A. 736.
 - for Missouri and Arkansas Drainage Basins, Colo. 736, U.S.D.A. 736.
 - for Oregon, Oreg. 736, U.S.D.A. 736.
 - for Rio Grande Drainage Basin, Colo. 736, U.S.D.A. 736.
- surveys, Nevada cooperative, 300.

Soaps and other water-softeners, selection by homemakers, 718.

Social organization, rural and rural sociology, 540.

Social problems, studies by station, N.C. 541.

Sodium—

- determination in presence of phosphates, 586.
- fluorescein as fertilizer, Tex. 599.
- fluoride, toxicity for cockroaches, 365.
- hydroxide, germicidal properties, evaluation, 243.
- thiosulfate, stabilization, 290.

Soil(s)—

- acidity, effect of potash and magnesia losses, N.C. 446.
- active manganese in determination, 452.
- alkaline-calcareous, plant food availability in, Ariz. 20.
- alluvial, of Mississippi drainage basin, properties, U.S.D.A. 162.
- and fertilizer studies, U.S.D.A. 594.
- and plant research, Federal-State cooperation in, 15.
- and root system, electrochemical relations, 447.
- and their use by men, 446.
- and water conservation, relation to grassland farming, 107.
- and water conservation studies, Tex. 15.
- and water losses under different conditions, N.Y.State 160.
- and water losses under different cropping methods, Ark. 15.
- bacteria, flagella staining technic for, 310.
- bacteria, pigments produced by, N.Y. State 159.
- bacterial activity, effect of soil treatments long continued, Mo. 15.
- base exchange capacity determination, 18.
- building, use of cornstalks and straw in, Mo. 15.
- carbon content under burning and non-burning, 185.
- classification, soil acidity relations as aid, N.C. 446.
- clay and colloid content determination, 6.
- colloids, *see* Colloids.

Soil(s)—Continued.

- colors, standardization, Ohio 301.
- composition, relation to plant and animal deficiencies, Tex. 21.
- conservation—
 - cover crops for, U.S.D.A. 186.
 - in West Virginia, economics of, W.Va. 395.
 - studies, N.Y.State 160.
- crop-producing capacity, maximum, Mont. 619.
- crust, cultivation for, Okla. 737.
- density, water content, and porosity relations, rapid calculation, nomograms for, 447.
- dry, thermal conductivity, 303.
- erosion—
 - control, Nebr. 15.
 - control, crop rotation as factor, 164.
 - control, effect of periodic close grazing and pasture fertilization, 596.
 - control practices for wartime needs, 688.
 - control, value of ground cover for, N.C. 446.
 - effect of irrigation water, Utah 595.
 - effect on fertility changes in Shelby loam profile, 164.
 - experiment station at Guthrie, Okla., work of, U.S.D.A. 737.
 - measurements and control experiments, revision, U.S.D.A. 164.
 - studies, Mo. 15.
 - variability of material eroded, 18.
 - wind, effect on composition and fertility of Alberta soils, 304.
 - wind, relation to types of vegetative cover, 453.
- extracts, silica and phosphoric acid in, 150.
- fertility—
 - and improvement studies, Tex. 42.
 - and maintenance, Miss. 300.
 - and soil tests, Colo. 738.
 - indices of, comparison, with peanuts, 185.
 - leguminous plant material incorporated with soil v. leguminous mulches for, 185.
 - level, effect on plant nutrient composition and consumption, Ind. 737.
 - studies, Kans. 595. Oreg. 595.
- field capacity and permanent wilting percentage in, jacketed thermal radiators as indicators, 302.
- for crop production, Miss. 159.
- forest, changes in microflora and composition of decomposing leaves, 185.
- free iron oxides in, removal, 164.
- freezing and forest cover, 452.
- from which old peach trees were removed, disinfection, N.C. 476.
- fumigation for control of crop pests, Tex. 60.
- greenhouse and field, chloropicrin for sterilizing, Ohio 331.

Soil(s)—Continued.

- heavy or alkaline, drainage and improvement, Oreg. 595.
- introductory course at Michigan State College, evaluation, 543.
- Laterite, and related soils of Thailand, analyses and profile, 163.
- management and crops for war production, Mich. 737.
- management, best systems for important soil types, Mo. 15.
- moisture—
 - conservation, Nebr. 15.
 - content indicator, electrical capacity of 2-electrode plaster of paris block as, 162.
 - content indicators, 2- and 4-electrode plaster of paris blocks as, 161.
 - continuous measurement by electrical resistance, absorbent materials for, 16.
 - determination, comparison of methods, 17.
 - measurement, new method, Ohio 300.
 - phenomena in frozen soils, 737.
 - potential, 595.
 - storage, utilization, and evaporation, Kans. 595.
 - variations, response of electrical resistance of 2- and 4-electrode plaster of paris blocks to, 448.
- movement by tillage implements, 829.
- Muskingum, water relations and erosion U.S.D.A. 17.
- nitrogen content, *see* Nitrification and Nitrogen.
- nutrients, chloropicrin as factor in mobilization of, 738.
- of Alabama in lysimeters, nitrogen losses from, 166.
- of Corn Belt States, effect of depth of topsoil and organic matter and nitrogen in, N.Y.State 160.
- of Georgia, available potash and phosphate in, Ga. 594.
- of Hawaii, boron in, 24.
- of Idaho, phosphate deficiency determination by *Azotobacter* plaque test, 166.
- of Illinois, runoff, percolate, and leach losses from, 450.
- of Mexico, textbook, 159.
- of Miami family and Miami catena, morphology and composition, U.S.D.A. 163.
- of New Jersey, pH values and lime requirements, N.J. 739.
- organic, and soil mixtures, structure shown by pH moisture studies, 161.
- organic matter in, *see* Organic matter.
- pasteurizer, continuous, 109.
- phosphate fixation in, control, 167.
- physical constitution of water-stable granules and of originating soil, 160.
- Piedmont, properties of B horizons, 302.

Soil(s)—Continued.

- productivity in profitable agriculture, 185.
- productivity, maintenance, Mont. 596.
- profile(s)—
 - mounts, preparing, method and demonstration, 595.
 - organic carbon distribution, 150.
 - studies, Nebr. 15.
- protection in Southwest, regrassing for, U.S.D.A. 756.
- reaction as basis for land management, practices, 19.
- receiving excess gypsum, calcium- and sulfate-ion concentrations in, 24.
- solution, relation to pH and other factors, Kans. 595.
- southern, organic matter in and available nutrients, effect of leguminous plant additions, 455.
- sterilization with chloropicrin and relation to effect of preceding crop, R.I. 301.
- sterilization with urea and calcium cyanamide, 484.
- sterilizer, inexpensive, description, 165.
- structure—
 - important item in soil fertility, Pa. 595.
 - microscopic method of study, 301.
 - nature and effect on tillage, Mo. 15.
- studies, application of polarograph in, 5.
- survey data, uses in regional development program, 185.
- survey in—
 - California, Pixley area, U.S.D.A. 595.
 - California, Wasco area, U.S.D.A. 302.
 - Iowa, Iowa 15.
 - New York, Albany and Schenectady Cos., U.S.D.A. 16.
 - New York, Seneca Co., U.S.D.A. 302.
 - North Carolina, Madison Co., U.S.D.A. 302.
 - North Carolina, Warren Co. U.S.D.A., 160.
 - Oklahoma, Tulsa Co., U.S.D.A. 302.
 - Rhode Island, Newport and Bristol Cos., U.S.D.A. 160.
 - Tennessee, Roane Co., U.S.D.A. 302.
 - Utah-Arizona, Virgin River Valley area, U.S.D.A. 595.
- surveys, importance in wartime adjustments, U.S.D.A. 594.
- synthetic, as bacteriological culture medium, N.Y.State 159.
- systems, dry cohesive, mechanism of water attack on, 450.
- testing as basis for fertilizer recommendations, 185.
- type pattern of Monkato drift plain in Iowa, effect of low recessional moraines, 302.
- types of Missouri, determination and mapping, Mo. 15.

Soil(s)—Continued.

volume-freezing-point relations observed with new dilatometer technic, 447.

water, *see* Soil moisture.

Yazoo River, fertilizer elements needed in, Miss. 598.

Solanum sp. from Chile, susceptibility to *Fusarium solani cumartii*, 352.

Solenopsis geminata, *see* Fire ant.

Solubea pugnax on sorghum, 783.

Solutoparies pythii n.g. and n.sp., description, 486.

Sophora to *Sorbus*, host-parasite check-list revision, U.S.D.A. 58.

Soremouth of sheep and goats, Tex. 99.

Sorghum(s)—

and corn and effects on succeeding crops, comparisons, Tex. 42.

and Johnson grass hybrid, F₂ and F₃ generations of, 185.

breeding, Kans. 618, Nebr. 41, Okla. 755, Tex. 42, U.S.D.A. 616.

breeding for low cyanide content, 185.

charcoal disease, Tex. 60.

charcoal rot, Nebr. 59.

crosses for waxy endosperm grain, Kans. 618.

deficiencies as feed for dairy cows, Kans. 671.

disease resistance in, breeding for, Kans. 640.

diseases, control, 210.

double cropping experiments, Tex. 42.

for Kansas, Kans. 329.

grain—

combined, curing in trenches, Tex. 42.

culture tests, Kans. 618, Tex. 42.

disease resistance in, Tex. 60.

fertilizer tests, Tex. 42.

harvesting and storing methods, Kans. 688.

irrigation tests, Tex. 42.

new, saving harvest labor and resistant to chinch bugs, U.S.D.A. 616.

variety-spacing test, Tex. 42.

variety tests, Ga.Coastal Plain 325, Kans. 618, Nebr. 41, Okla. 755, Tex. 42.

grains, industrial utilization, Kans. 579.

heat, light, and drought tolerance in, Kans. 618.

inheritance studies, Tex. 42.

kernel smut control, new fungicides and reduced dosages for, 490.

plant characters induced by radiation, inheritance of, 608.

planting tests, Nebr. 41.

response to fallow and other tillage practices, Nebr. 41.

sirup, homemade, W.Va. 441.

sirup, utilization, Ga. 579.

smuts, pathogenicity and genetics, Minn. 489.

starches from, U.S.D.A. 723.

value for feed and food, Ark. 40.

Sorghum(s) — Continued.

waxy starches (replacing tapioca) from, U.S.D.A. 617.

Sorgo —

breeding, Kans. 618, Tex. 42, U.S.D.A. 616.

byproducts from, U.S.D.A. 723.

Leoti, for starch, Nebr. 475.

planting for production of high-proof alcohol for explosives, U.S.D.A. 617.

sirup as source of alcohol, U.S.D.A. 723.

variety tests, Ga.Coastal Plain 325, Kans. 618, Nebr. 41, Okla. 755, Tex. 42.

Sowbugs control, 501.

Sows—*see also* Pig(s) and Swine.

brood —

effect of manganese in rations, Mo. 84.

ground alfalfa for, Mich. 668.

performance, effect of diet, 514.

individuality in regard to size of litter, 612.

litter size and weight as permanent characteristics, U.S.D.A. 318.

management and breeding, Ga.Coastal Plain 373.

Soxhlet extractor, improved, 290.

Soybean(s)—

Arkan. Magnolia, Boone, and Gibson varieties, U.S.D.A. 616.

Biloxi, microsporogenesis in, effect of photoperiod, 465.

breeding, Ark. 755, Mo. 41, Nebr. 41, U.S.D.A. 616.

culture tests, Kans. 618, Miss. 186, Tex. 42.

diseases, U.S.D.A. 58, 343, 640.

edible, food crop for Hawaii, 624.

edible, undetermined virus disease, U.S.D.A. 58.

edible, variety tests, Tex. 42.

effect of day length on, U.S.D.A. 607.

effect of hormone treatments, Miss. 618.

emergency storage for, Mo. 835.

fast-drying oil from, U.S.D.A. 723.

feeding to pigs, 514, 797.

fertility needs and cultural practices for, Mich. 755.

fertilizer tests, Kans. 618.

fiber development by Ford, 865.

flour, kinds, as pollen substitutes, 83.

frogeye leaf spot, new records for, U.S.D.A. 58.

Gibson and Patoka, adaptations, characteristics, and yields, Ind. 476.

hogged down, minerals with, N.C. 514.

hogging off, Ga.Coastal Plain 373.

infection with *Rhizobium japonicum*, effect on fodder yield and quality, 773.

meal as feed for lambs, Kans. 666.

meal in poultry feed, 378.

meal in rations for fattening cattle, laxative nature, 513.

meal, plastics from, U.S.D.A. 723.

meal with pilchard fish meal or meat meal, combinations, gross values, 236.

Soybean(s)—Continued.

- new crop for Puerto Rico, culture, P.R.U. 476.
 nodule bacteria strains associated with different host varieties, N fixation by, 176.
 nutrients in, effect of soil fertility, Ind. 737.
Peronospora on, U.S.D.A. 203.
 planting tests, Ga. 617.
 plants, amount of boron absorbed by and effect on growth, 645.
 production, adaptation on cotton farms for oil mills, Ark. 753.
 production in Kansas, Kans. 330.
 protein as source of amino acids for chick, 801.
 respiration and storage behavior, Minn. 431.
 root knot resistance, varietal, 484.
 root knot studies, Ga. 617.
 Seminoles, increase of seed, P.R. 619.
 studies, W.Va. 473.
 varieties, Mich. 755.
 varieties, earlier, tests, Ohio 326.
 varieties for seed, N.C. 473.
 varieties, relative adaptations among, physiological causes, Mo. 25.
 variety tests, Ark. 755, Ga. 617
 Ga.Coastal Plain 325, Kans. 618, Miss. 186, 325, Mo. 41, Nebr. 41, Pa. 619, Tex. 42.
 war crop for Delta farmers, U.S.D.A. 45.
 with and without preservatives for milk production, U.S.D.A. 670.
Spartium to Syringa, host-parasite check-list revision, U.S.D.A. 202.
 Specimens, embedding in methacrylate resins, U.S.D.A. 5.
 Spectrograph, inexpensive, for analysis of plant ashes, 190.
 Spermatogenesis—
 in hypophysectomized rats following injection of gonadotropins, effect of testosterone propionate, 472.
 in rats, 751.
 Spermatozoa—
 bovine epididymal, metabolism, 323.
 bull, cytochrome oxidase in, 728.
 bull, nonhemin and total iron in, 727.
 survival in female reproductive tract of bat, 324.
Sphacelotheca sorghi, pathogenicity and genetics, Minn. 489.
Sphaerotheca lanestris on live oak, 780.
 Sphagnum—
 use for growing seedlings, U.S.D.A. 627.
 use to control damping off, N.J. 646.
 Spice—
 contamination control, 291.
 crops, culture, P.R. 628.
 Spider—
 beetle, California, in insect nests, 73.
 fauna of Puerto Rico, additions to, P.R.U. 83.
 mite, *see* Red spider.

Spilonota ocellana, *see* Budmoth, eye-spotted.

- Spinach—
 dehydration tests, 849.
 leaf proteins, isolated, release of auxin from, 213.
 leaves, chloroplast substance of, 464.
 seed-borne micro-organisms, N.Y.State 203.
 seed treatment, Miss. 354, Tex. 59.
 soil calcium and oxalate content, 604.
 thiamin determination in, 438.
 wilt caused by *Fusarium* sp., N.J. 491.
 Spleen in male rats, effect of thyroidectomy, castration, and replacement therapy, 755.
Sporocytophaga myxococcoides, notes, 305.
Sporodinia pattern, 486.
Sporotrichum malorum and *Phialophora malorum*, relation, 492.
 Spotted fever in Gulf coast of Texas, 388.
 Spray(s)—*see also* Fungicide(s), Insecticide(s), and specific forms.
 concentrated, experiments, 782.
 copper, *see* Copper.
 injury, correctives for reducing, Mo. 47.
 mixture, inverted, use of term, 783.
 oil, *see* Oil sprays.
 rigs, use for fire-extinguishing purposes, Mich. 692.
 tests, Pa. 652.
 winter, season for, Miss. 786.

Spruce—

- Alaskan airplane, importance of fungi and defects in handling, 780.
 and fir stands, effect of cutting on volume, 638.
 beetle, eastern, estimation of forest damage by, 219.
 budworm, notes, Mont. 655.
 defoliators identification, frass key for, 502.
 Norway, planting stocks, tests, N.Y.State 200.
 sawfly, European—
 biological control in New Hampshire, 511.
 control, 372.
 diapause and egg intoxication in, 511.
 distribution in Scandinavian and eastern Baltic countries, 511.
 natural control by small mammals, 664.

Spurge, caper, proteolytic enzyme in latex of, 29.

Squab raising, U.S.D.A. 379.

Square root transformation and analysis of variance, use with contagious distributions, 361.

Squash—

- blister beetle, biology, 227.
 borer control, Conn.[New Haven] 499.
 breeding, N.Y.State 191.
 bug control, Mo. 72.
 bug, effect of sulfonated oils combined with cube and derris, 787.

Squash—Continued.

- bug studies, Tex. 73.
- culture, Mont. 628.
- disease-resistant and improved varieties, development, N.Y.State 191.
- plants, growth in water culture, effect of micro-organisms, 67.
- summer, loss of vitamin C during cooking, 862.
- yields, relation to insect control, Ohio 362.

Squirrel(s)—

- fox and gray, animal parasites of, 497.
- gray, habitat distribution of, 300.

Stablefly—

- breeding in shore deposits of bay grasses, control, 371.
- control, 654.
- false, parasitic habits, 662.
- studies, U.S.D.A. 98.
- waste celery as important breeding place, control in, 509.

Stachytarpheta virus diseases, 779.**Staggers syndrome in sheep and cattle grazing on *Phalaris tuberosa*, 528.****Stain(s)—**

- biological, N.Y.State 149.
- removal from fabrics, home methods, U.S.D.A. 286.

standardization, progress in, 607.**Staining rack for handling cover-glass preparations, 317.****Stallion enrollment, Ind. 800.****Standard of living, empirical test of definition, 844.****Standards, biological, reports on, 183.****Staphylococcal toxins, studies, 242.****Staphylococci control in foods, 408.*****Staphylococcus aureus*, cause of loss of turkey poult, 105.****Starch(es)—**

- evaluating for textile purposes, 8.
- reserve, effects of growth substances, 461.
- solutions, stabilization, 290.
- structure and mechanism of formation, 456.

Starlings—

- and foot-and-mouth disease, 387.
- oogenesis in, 38.

Starter solutions, use of, N.Y.State 191.**Steers—see also Cattle, beef.**

- alfalfa-molasses silage for, Pa. 666.
- blood plasma ascorbic acid of, effect of gonadotropic substance of pregnant mare serum, 38.
- fattening—
 - cottonseed meal v. peanut meal for, Tex. 85.
 - oats for, Okla. 797.
 - on ground hegarl fodder v. ground redtop fodder, Tex. 85.
 - rations, maintenance and growth requirements, 797.
 - velvetbeans, cottonseed meal, and peanut meal as protein feeds for, U.S.D.A. 85.

Steers—Continued.

- feeding, comparisons of rations, Ga. Coastal Plain 872.
- feeding program, use of pasture in, Mich. 667.
- sweetpotato pulp for, U.S.D.A. 665.
- wintering on crested wheatgrass, Mont. 667.
- yearling, finishing, cottonseed meal as supplement to feeds for, N.C. 514.
- yearling, protein supplements, comparison, 513.

Stegasta bosqueella* on peanut and partridge pea, Ga. 654.**Stegobium paniceum*, see Drug store weevil.*****Stemphylium* gray spot of tomatoes, Tex. 59.*****Stephanoderes flos*, studies, Tex. 73.****Sterilization and cleaning studies, N.Y.State 149.*****Sternocochus paludatus*, life history, habits, and control in New Mexico, U.S.D.A. 505.****Stinkbug—**

- Say, notes, Mont. 655.
- Say, on cotton, control by dusts, 504.
- southern green, Tex. 73.

Stock, see Livestock.**Stock foods, see Feeding stuffs.****Stockyards fever, see Septicemia, hemorrhagic.****Stomach worms—**

- in range sheep, phenothiazine-medicated pellets for, 103.
- in sheep and goats, Tex. 99.
- in sheep, relation to diet, 682.

Stomoxys calcitrans*, see Stablefly.*Storages, air-cooled, effect of ice on temperatures in, 190.****Stoves, pressure gasoline and pressure kerosene, Nebr. 287.****Strangles, vaccination against, 530.****Straw left by combine, baling methods, 833.****Straw, use in soil building, Mo. 15.****Strawberry(ies)—**

- beds, renovation, N.C. 476.
- Blakemore, yields, effect of renewal systems and width of row, 53.
- breeding for South, 627.
- culture, Ark. 763.
- diseases, Idaho 493, Oreg. 641.
- Dunlap, effect of naphthaleneacetic acid in promoting parthenocarp in, Nebr., 47.
- effects of mulching, Ark. 762.
- fertilizer requirements, N.Y.State 193.
- fertilizers for, N.C. 340.
- fertilizing, time factor in, N.C. 476.
- flower development and structure, effect of fertilization and pruning, Ark. 40.
- insects, control, Ark. 783, Mo. 72.
- leaf blotch in Great Britain, 777.
- leaf roller, biology and control, Kans. 655.
- mites, dusting for control, N.C. 500.
- mulching, Kans. 628.
- nitrogen requirements, Ark. 762.
- nutrition in upper South, 627.
- nutritive requirements, N.C. 476.
- plant behavior, effect of mulch, 53.

Strawberry(ies)—Continued.

- plant, effect of high temperature, Okla. 763.
 plants, inoculation with *Phytomonas fasciens*, 215.
 preservation with sulfurous acid, Ga. 700.
 red stele root rot, serious new disease, Mich. 777.
 sawdust mulch for, Ga. 627.
 sun-ripened v. shade-ripened, vitamin C in, N.C. 476.
 Tennessee Beauty, new variety, Tenn. 635.
 value of stable manure for, Ark. 763.
 varieties, plant-spacing experiments, 53.
 variety tests, Ga. 627.
 vitamin C determination in, variations in samples, 713.
 weevil, toxicity of insecticides to, laboratory tests, 361.
 yield and grade, effect of renovation of beds after harvest, 481.
 yields, effect of fertilizers, Ga. 627.
 treann flow—
 and snow cover in Colorado, correlation, 299.
 effect of wall-friction on gravity-waves, 392.
Streptococci—
 active resting cells, production, 458.
 equine, studies, 529.
 hemolytic, from horse treated with sulfanilamide, 390.
Streptococcus—
 agalactiae—
 dehydrogenation of alcohols by, 600.
 housefly as vector, 101.
 pathogenicity for mice and treatment with sulfanilamide, 678.
 equi, cross-immunity to, 530.
 equi, experimental immunity to, 529.
Strip cropping for war production, U.S.D.A. 737.
Strongyloides—
 papillosus, percentage incidence in cattle, 101.
 ransomi in heart tissue of pigs, death due to, 384.
Stubble mulch culture, relation to machinery developments in, 185.
Stumpage and log prices for 1939 and 1940, U.S.D.A. 58.
Subulina octona, injury to vanilla plantings, P.R. 656.
Succinoxidase system—
 effect of calcium salts on, mechanism, 853.
 of rat livers in riboflavin deficiency, 856.
Succinylsulfathiazole in veterinary practice, 677.
Sudan grass—
 as supplement to native grass for pasture, Kans. 618.
 breeding, Tex. 42.
 hybrids, disease resistance in, Tex. 60.

Sudan grass—Continued.

- increasing yield of dry matter, nitrogen, and vitamin C, 624.
Sugar(s)—see also Glucose, Lactose, etc.
 and coffee tablets for the Army, U.S.D.A. 723.
 and its substitutes, Conn.[New Haven] 127.
 determination, Lane-Eynon method, modification, 590 .
 dextrose and sucrose, effect on ice cream properties, 382.
 in ice cream, 240.
 in plants, effect of cations (K, Na, Ca) on conversion, 604.
 more from domestic sources, U.S.D.A. 723.
 rationing objectives and allotments, 393.
 receipts and distribution in United States, 1934-39, U.S.D.A. 695.
 substitutes and their uses, Mont. 545.
Sugar beet(s)—
 breeding, U.S.D.A. 616.
 diseases, Nebr. 59.
 diseases, control, Mont. 641.
 distribution of mineral elements in, effect of preceding crops, 624.
 effect of day length on, U.S.D.A. 607.
 fertilizer tests, Mont. 619.
 growing, labor-saving devices, Colo. 761.
 grown for seed, irrigation, U.S.D.A. 45.
 growth, effect of soil structure, 16.
 improved leaf spot resistant, U.S.D.A. 617.
 irrigation tests, Tex. 42.
 labor needs for, Mich. 755.
 leaf blight, control, Ohio 344.
 leafhopper, *see* Beet leafhopper.
 photosynthesis and respiration in, 746.
 research, Utah 619.
 seed growing profitable in certain areas by new production methods, Utah 619.
 seed, important farm crop, Utah 619.
 seed, new segmented, for labor saving, Utah 620.
 seed production, Oreg. 619.
 seed treatments with plant hormones, 624.
 seed yields, effect of spacings, U.S.D.A. 617.
 sucrose in, effect of soil and cultural practices, 761.
 variety tests, Tex. 42.
 wireworm adults, flight of, 78.
 workers, migratory, in Michigan, Mich. 271.
 yields, effect of manure, alfalfa, and pastured sweetclover on, Nebr. 41.
 yields, limiting, by lack of air in soils, Ohio 326.
Sugarcane—
 borer—
 biological control, 508.
 • control, 654, La. 362.

Sugarcane—Continued.**borer—continued.**

fly parasite of, receipt of shipments, liberations, and shipment to Cuba, P.R. 655.

losses caused by, La. 362.

resistant varieties, development and use, 508.

studies, 225.

breeding, U.S.D.A. 616.

byproducts from, U.S.D.A. 723.

chlorotic streak, experiments with, 205.

disease testing and seedling selection at Houma Station, 210.

disease-tolerant, U.S.D.A. 617.

diseases, "foreign" and those present in Hawaii, 352.

effects of colchicine on anatomy and histology, 317.

first application of nitrogen, 625.

frog hopper studies, 222.

growth rates, 625.

in India, new pest of, 658.

juice, limed, calcium phosphate precipitate in, 593.

juice quality affected by lodging, 45.

nutrient deficiencies in, methods of determining, 603.

research at agricultural experiment station of University of Puerto Rico, 625.

rootstock weevil in sweet corn, Kans. 655.

shocked, and silage with carpet grass as roughage for beef herd, Fla. 232.

smut studies, 773.

stem galls induced with insect extracts, 502.

variety tests, Miss. 325, P.R. 619.

white moth borer, natural enemy of, 793.

yields, effect of hot water treatment of seed cane, 211.

Suits, men's, mending, U.S.D.A. 867.**Sulfaguanidine—**

chemotherapy in enteric conditions of swine, 520.

effect on rat growth and plasma prothrombin, 854.

in veterinary medicine, 677.

Sulfanilamide compounds, action on lethal factor of bacterial toxins, 677.**Sulfasuxidine succinylsulfathiazole in veterinary practice, 677.****Sulfathiazole—**

and methyl derivative, antibacterial activity, 243.

for colds in chickens, 824.

use in prevention and treatment of infectious coryza, 686.

Sulfonamides, therapy in practice, 677.**Sunflower(s)—**

growth and development, effect of boron, 774.

hogging off, Ga.Coastal Plain 373.

leaves, *Alternaria* on, in India, 211.

seeds, sulfur in and seed weight in relation to effects of sulfur deficiency, 172.

Sunlight lamps for laying hens, Nebr. 379.

Sunshine, fall and winter, antirachitic effectiveness, 566.

Sunspot data, 593.

Sunspot period and spring rainfall in United States, 593.

Superphosphate(s)—

chemical properties before and after ammoniation, 456.

effective utilization, effect of preliming, 598.

sludge-acid, plant culture and nitrification studies with, 167.

Swamp fever, *see* Anemia, equine infectious.

Swamps, forested, drainage, 639.

Swans of North America, life history, 653.

Sweet, thiamin in, 137.

Sweet corn—*see also* Corn.

bacterial wilt, scarcity of, U.S.D.A. 58.

breeding, N.Y.State 191.

culture and strain tests, N.Y.State 191.

ear rot, U.S.D.A. 343.

earworm control in, 660.

heat and drought tolerance, effect of tillers, 48.

Helminthosporium blight, N.J. 490.

hybrid tests, N.J. 490.

hybrids, increase of quality of table corn by, N.C. 473.

kernels, auxin in, relation to endosperm type, 28.

market, protecting from European corn borer, U.S.D.A. 226.

new, Cherokee, breeding, Ga. 627.

pollen, sugar content and aphid susceptibility, 48.

varieties for Montana, Mont. 628.

variety tests, Miss. 191.

yield and quality, effect of irrigation water, 477.

Sweet pea—

powdery mildew control by fungicides and resistant varieties, R.I. 314.

seed and root rots, treatments for, R.I. 344.

Sweetclover—

biennial, response to moisture, temperature, and day length, 761.

biennial white, inheritance of growth habit, cotyledon color, and cup-leaf in, 748.

biennial white, inheritance of seed color in, 718.

breeding, Nebr. 41, Tex. 42, U.S.D.A. 616.

coumarin determination with, Nebr. 41.

culture tests, Okla. 756, Tex. 42.

cutting and palatability tests, Nebr. 41.

disease, hemorrhagic, studies, 817.

efficiency of phosphate fertilizers on calcareous soil for, 758.

fertilizer tests, Kans. 618.

for green manure, Utah 186.

pasturing with sheep, Nebr. 41.

root- and crown-rotting fungi in Alberta, varietal resistance, 349.

Sweetclover—Continued.

- rotations, need for plenty of K, Ohio 326.
- superior varieties or strains grown by station, Oreg. 619.
- variety tests, Alaska 617, Kans. 618, Nebr. 41, Tex. 42.
- weevil, newly introduced pest, Mont. 652.
- weevil, notes, Mont. 655.

Sweetpotato(es)—

- and vine storage in pit silos, Ga. 666.
- bedding roots, nematode control in, Okla. 769.
- breeding, Miss. 186, Okla. 755, Tex. 42.
- care in handling and storage necessary, Miss. 325.
- carotene in, 185.
- carotene in, effect of storage and of breeding, 855.
- culture tests, Miss. 186, N.J. 189.
- curing and storage, 185.
- curing and storage, use of electricity in, 186.
- diseases, prevention, 623.
- drying by natural means, cost and rate, 185.
- fertilizer tests, Ga. 617, Ga.Coastal Plain 325, Miss. 186, N.J. 189, Tex. 42.
- flowering in, factors affecting, 186.
- Fusarium* wilt on tobacco, N.C. 473.
- hogging off, Ga.Coastal Plain 373.
- improving profits on, 622.
- internal break-down due to exposure to cold, La. 352.
- meal and milk-producing ration for cows, 807.
- meal and peanuts on vine as milk-producing feed for dairy cattle, Ga. 671.
- N and K top dressings for, Ga.Coastal Plain 325.
- plant and livestock feed, Miss. 85.
- plant, complete usage, program for determining, 185.
- planting, spacing, and curing tests, Ga. 617.
- processing for livestock feed, machinery for, 258.
- pulp for steers, U.S.D.A. 665.
- ratios of organic:nonorganic N with, Ga.Coastal Plain 325.
- roots, disinfection, Miss. 203.
- secondary nutrient elements for, Ga. Coastal Plain 325.
- starch and carotene from, U.S.D.A. 723.
- storage experiments, Okla. 756.
- storage, spacing, and slip production, Miss. 186.
- studies, Tex. 42.
- varieties for starch production and market purposes, cooperative tests, U.S.D.A. 189.
- vines and tubers for feed, U.S.D.A. 723.
- weevil, biology and seasonal history, La. 362.

Sweetpotato(es)—Continued.

- weevil, reaction under different qualities of light, La. 362.
 - weevil, toxicity of poison baits to, La. 362.
- Swine—*see also* Pig(s) and Sows.
- closed herds, selection for growth rate and productivity in, 610.
 - disease, transmissible, report of committee on, 814.
 - enteritis, nicotinic acid for prevention, 103.
 - erysipelas, Nebr. 103, Oreg. 676, U.S.D.A. 676.
 - erysipelas antiserum, Nebr. 99.
 - erysipelas infection in man, Nebr. 242.
 - fever, crystal violet vaccine for prevention, 246.
 - herds of the station, N.Dak. 373.
 - influenza, studies, 814, U.S.D.A. 98.
 - influenza virus, swine lungworm as reservoir and intermediate host, 822.
 - influenza virus, synergistic action on chick embryo, 824.
 - with inherited bleeding disease, abnormal capillary resistance in, 684.
 - with inherited bleeding disease, anomaly of normal Duke's and very prolonged saline bleeding time, 529.
- Symphylids, studies, Oreg. 655.
- Symptomatic anthrax, *see* Blackleg.
- Systema blanda*, *see* Flea beetle, pale-striped.
- Tabanus orientis*, feeding habits and transmission of rinderpest experiments, 244.
- Tabebuia* to *Theaspesia*, host-parasite checklist revision, U.S.D.A. 202.
- Tachinidae, new North American, 227.
- Taenia pisiformis*, cysts of squirrel, 497.
- Taeniothrips—
- inconsequens*, *see* Pear thrips.
 - simplex*, *see* Gladiolus thrips.
- Talitrus sylvaticus*, household pest in California, 362.
- Tamarisk canker in Argentina, 359.
- Tangerines, puffy, in packing house process, cause and prevention, 198.
- Tannages, chrome-saving, U.S.D.A. 723.
- Tanning materials, domestic, developing, U.S.D.A. 723.
- Tapeworms of cattle, U.S.D.A. 98.
- Tarnished plant bug on alfalfa, effect of sulfur with other materials, 782.
- Tarsonemus bakeri*, recently discovered on citrus, 230.
- Tarweed seed in grain as poultry feed, 685.
- Tax(es)—
- assessments, inequalities of, and delinquencies in San Saba Co., Tex. 111.
 - burden, property, of Tennessee farmers, Tenn. 841.
 - delinquent farm, rate of payment, N.C. 587.
 - income, estimation of revenue and incidence, Iowa 120.

Tax(es)—Continued.

- rates on farm real estate, recent changes in, N.C. 538.
- trend in representative counties, Tex. 111.

Taxation, farm, in Nevada, Nev. 538.

Taxonomy—

- and phylogeny, 460.
- insect, significance of economic entomology in, 499.
- relation to biological control, 499.

Teeth—

- decay, effect of nutritional supervision on, 412.
- decay of children and topically applied fluorine, 567.
- decay of children, effect of massive doses of vitamin D, 569.
- decay of rats, induced, effect of fluorides and iodoacetic acid, 568.
- decay, role of nutrition in, 566.
- effect of low calcium and vitamin D-deficient diet of mature rats, 567.
- of dog, fluorine acquired by, 569.

Teleonemia nigrina, new pest of snapdragon and verbena, 362.

Temperature(s)—see also **Climate(s)**.

- air, annual march, effect of Great Lakes on, 12.
- contrasts in the United States, 12.

Tephrosia extract against houseflies, 658.

Termite(s)—

- ants, and plants, ecological relations, 311.
- dry-wood or powder-post, control, P.R. 656.
- exposure test, international, 787.
- subterranean, preventing damage to buildings, and control, U.S.D.A. 658.

⁶ Terrace construction by plowing, 253.

Terrapin scale parasites, effect of dormant sprays on, 510.

Testes—

- deer, oestrogens in, 752.
- of opossum, response to androgenic treatments, 39.

Testosterone, colorimetric reaction for, 590

Tetrachloro-*p*-benzoquinone as growth stimulant, U.S.D.A. 58.

Tetranychus tritici, covering stubble for control, Okla. 783.

Tetranychus, see **Red spider**.

Tetraploidy—

- in snapdragon induced by sanguinarine hydrochloride, 180.
- in tomatoes induced by colchicine, 179.
- induced, hereditary transmission and compatibility in fertilization, 181.

Tetrastichus belpyri, effect of dormant sprays on, 511.

Tettigidea parvipennis—

- genetics of, 612.
- inheritance of, Kans. 655.

Texas Station report, 142.

Textile(s)—see also **Fabric(s)**.

- and synthetic fibers, Kans. 140.
- flexural fatigue of, 573.
- materials, A. S. T. M. standards on, 716.
- resilience of, determination, 285.
- sanitization of, 573.

Theobaldia inornata, biology in captive colony, 793.

Thermobia domestica, see **Firebrat**.

Thiamin—see also **Vitamin B₁**.

- and fungi, interaction, 602.
- and riboflavin deficiencies, relation, Ark. 845.

chemical determination, 592.

deficiency—

- and thiamin requirement of man, 138, 710.
- in pigs and methods of assay, 684.
- in rats, mechanism of bradycardia in, 818.

determination, modified microfermentation method, 592.

effect on appetite and growth of rat, 558 in average American diet, 414.

in blood cells and urine of humans, measurement and metabolism, 415.

in citrus fruits, 586.

in common American trees, 313.

in defatted milk solids, 674.

in honey of different localities, 550.

in milk, free and combined, 137.

in milk of various kinds, 414.

in peas, effect of sodium bicarbonate, 858.

in prepared foods, 281.

in rice and rice milling products, Ark. 845.

in sweat, 137.

in vegetables, determination, 438.

in white flour, 436.

in white flour milled by stone milling process, 857.

in wild rice, 857.

intake, and relation to other dietary constituents in food, 553.

normal requirement and factors affecting utilization and excretion, 554.

production by *Actinomyces viridochromogenus*, 458.

retention in self-rising flour biscuits, 557.

urinary excretion—

as index of nutritional level, 138.

in children, 710.

in patients with chronic hepatic disease, 553.

Thielaviopsis basicola, cause of root rot of cotton, 62.

Thiobacillus thiooxidans—

metabolism in absence of oxidizable sulfur, 740.

study with electron microscope, 459.

"Thiosan," new turf fungicide, 206.

Thistle, Canada, control, Oreg. 619.

Threonine in proteins, lability toward alkali and its consequences, 582.

Thrips—

- new, on tuberose bulbs, 222.
- on roses, Tex. 73.
- red-banded, parasite of, rearing and liberation, P.R. 656.

Thrips tabaci, see Onion thrips.*Thuja* to *Tsuga*, host-parasite check-list revision, U.S.D.A. 343.

Thymus in male rats, effect of thyroidectomy, castration, and replacement therapy, 735.

Thyroid—

- desiccated, effect on mammary growth in male mice, 321.
- extracts, effects on poultry, 321.
- guinea and chick, comparison in assay of thyrotropic hormone, Mo. 34.
- relation to growth, 321.

Thyrolactin, effect on milk production, metabolism, and growth, 91.

Thyronectria austro-americana disease of honey locust, U.S.D.A. 58.

Thyroprotein, highly active, chemical formation, 91.

Thyroxin, in vitro formation by thyroid tissue, 726.

Thysanus pulchra, effect of dormant sprays on, 511.

Tick(s)—

- affecting dogs, U.S.D.A. 98.
- Canadian, laboratory rearing, 500.
- collected on Tama (Iowa) Indian Reservation, 230.
- control, 372.
- eradication studies, U.S.D.A. 676.
- fever of cattle, U.S.D.A. 98.
- fowl, new vector of anaplasmosis, 826.
- Gulf Coast, relation to screwworm infestation in livestock, Tex. 99.
- lethal temperatures for, in British Columbia, 372.
- lone star, as vector of spotted fever in Texas, 388.
- new species on shrews, 230.
- Rocky Mountain wood, microbial flora of, 512.

Tillage operations, movement of soil during, 820.

Tilletia—

- levis* crosses, inheritance of reaction to race 8, 609.
- tritici*—see also host plants.
- and *T. levis* hybrids, extent of pathogenicity, 608.

Timber—see Lumber and Wood.

- marketing studies, Ark. 768.
- saw, survey in Clearfield County, Pa. 638.
- stand improvement, Miss. 342.

Time interval, determining, slide rule for, 473.

Timothy—

- development, effect of soil temperature, 43.
- for pasture and hay, seeding practices and seeds, N.J. 187.

Timothy—Continued.

hay, value as sheep feed in response to soil treatment, Mo. 15.

hays, vitamin A and carotene values, U.S.D.A. 870.

meadows, superiority on fertile soil. Ohio, 301, 326.

nutrients in, effect of soil fertility, Ind. 737.

yield and feeding value, effect of fertilizers, Mo. 41.

Tin, absorption and excretion by man, 279.

Tineola bisselliella, see Clothes moth, webbing.*Tiphia shastensis* n.sp., 371.

Toad(s)—

and frogs of United States and Canada, handbook, 654.

giant, feeding habits, 217.

in Oklahoma, food of, 498.

Tobacco—

American, types, use and markets, U.S.D.A. 403.

attacked by sweetpotato *Fusarium* wilt, N.C. 473.

bacterial wilt, resistance to, 645.

black shank, new introduction into Kentucky, U.S.D.A. 202.

breeding for black root rot resistance, 484.

budworm, mixing poisoned bait for, 498.

budworm, parasite of, 783.

cigar-leaf, sources of K for fertilizers, Pa. 619.

cigar wrapper, studies, Ga.Coastal Plain 325.

crops improved after natural weed fallow, U.S.D.A. 617.

culture experiments, Ga.Coastal Plain 325.

culture practices and root knot control in plant beds and field, Ga.Coastal Plain 344.

diseases in Maryland, U.S.D.A. 640.

diseases in Virginia, U.S.D.A. 343.

downy mildew control by new spray, 352.

downy mildew, new fungicide for, U.S.D.A. 640.

downy mildew, organism causing, 774.

etch virus, measurement of strain, 430.

fertilizer placement for, Ga.Coastal Plain 325.

fertilizer tests, Ga.Coastal Plain 325.

flue-cured—

diseases, Ga.Coastal Plain 344.

new varieties, introduction, N.C. 473.

nutrient absorption by, time and rate, 625.

recommendations on, Ga.Coastal Plain 325.

variations in prices, N.C. 400.

Fusarium wilt, increase in following sweetpotato, U.S.D.A. 640.

hornworm, nature of "cobalt" recommended for control, 490.

Tobacco—Continued.

- leaf spot bacteria, association with roots of crop plants, 211.
- leaves, effect of water extraction on acyl derivatives of mosaic virus protein, 646.
- leaves, water-soaked, entrance of non-motile bacteria and chemicals, 437.
- magnesium absorption by, effect of source, 456.
- mosaic disease control by breeding, 354.
- mosaic disease, phytopathological classics, 211.
- mosaic virus—
 - biologically active, formation, 65.
 - concentration and purification, 353.
 - containing radioactive phosphorus, preparation and use, 354.
 - effect of cyanide on synthesis of, 646.
 - effect on protein content of susceptible and resistant strains, 353.
 - nucleic acid of, molecular size and shape, 352.
 - protein, amino acids of, fractionation, 353.
 - protein, viscosimetric studies, 646.
 - spread in tomato fields, U.S.D.A. 640.
 - strain causing necrosis and shriveling of tomato foliage, 356.
 - strains, comparison of alkaline cleavage products, 353.
- nicotine and nicotinic acid from, U.S. D.A. 723.
- nicotine in, determination, modification of Official method, 590.
- nicotine production from, U.S.D.A. 45.
- of Southern States, demand for, trends in, Ky. 842.
- on extremely acid soils, poorer root growth of, N.C. 473.
- plant beds, need for less fertilizer on, N.C. 473.
- plant beds, weeds and disease control in, N.C. 473.
- quality and yield, gains in, N.C. 473.
- ring spot on edible soybeans, U.S.D.A. 58.
- ring spot virus, effect of cyanide on synthesis of, 646.
- root diseases, rotations as control factors in, N.C. 473.
- root knot, increase in, following sweet-potato, U.S.D.A. 640.
- roots, excised, nicotine synthesis in, 744.
- rotations, Ga.Coastal Plain 325.
- rows, grade of, effect on drainage and erosion control, N.C. 446.
- secondary nutrient elements for, Ga. Coastal Plain 325.
- shade, diseases, Ga.Coastal Plain 344.
- stocks, plants grafted on, nicotine formation in, 174.

Tobacco—Continued.

- thrips on shade-grown tobacco, control, 503.
 - warehouses, costs of operating, N.C. 537.
 - yields, high, in manured and fertilized rotations, Ohio 326.
- Tocopherol—
- and stability of carotene, 855.
 - dl α. in serum, photoelectric determination, 592.
- Tomato(es)—
- anthracnose, new spray for control, N.Y.State 776.
 - ascorbic acid in, effect of mineral nutrition, 560.
 - bacterial canker, control, 355.
 - Bay State, bred for resistance to leaf mold, Mass. 49.
 - blossom-end rot and fruitfulness, macro-element nutrition, 213.
 - blossom-end rot, varietal resistance to, Tex. 59.
 - breeding, Nebr. 47.
 - breeding for resistance to nematodes and diseases, Ga. 627.
 - breeding, use of X-rays in, N.Y.State 191.
 - bushy stunt virus, new crystalline forms, 647.
 - canned, wartime marketing problems of, Ark. 841.
 - canning, diseases and control, N.Y.State 203.
 - catsup as source of vitamin C. 862.
 - collar rot resistance, 355.
 - culture, Mont. 628.
 - culture tests, Ga.Coastal Plain 331, Miss. 191.
 - cuttings, effect of growth substances on starch reserve in, 461.
 - defoliating diseases, anthracnose, and shoestring disease, weather effects, N.J. 490.
 - defoliating diseases, fungicidal control, Ark. 769.
 - direct seeding v. transplanting, Ohio 331.
 - disease(s)—
 - conspectus for, 491.
 - control, Utah, 647.
 - in New York, U.S.D.A. 58
 - resistant, development, Ark. 59.
 - studies, Tex. 59.
 - early blight—
 - breeding for resistance to, Tex. 59.
 - prevention, Miss. 203.
 - spread and development, Ga.Coastal Plain 344.
 - studies, U.S.D.A. 58.
 - susceptibility increased by wilt infection, Miss. 354.
 - Early Chatham, merits, Mich. 765.
 - effect of platinum chloride, 402.
 - effect on urinary acidity and blood alkali reserve, 277.
 - excised root systems, water uptake by, due to nonosmotic forces, 464.

Tomato(es)—Continued.

- fertilizer requirements, N.Y.State 191.
- fertilizer tests, Ga.Coastal Plain 381.
- fertilizer treatment, plant tissue tests as guide, Ky. 765.
- field plat technic studies with, 477.
- food value, relation to soil fertility, Ohio 381.
- fruit production, effect of chloropirrin—
 - roll-treatment and fungicides, R.I. 344.
- fruit rot, U.S.D.A. 58.
- fruit rot control, varietal resistance and mulching for, Colo. 776.
- fruitfulness in, chemicals to stimulate, 334.
- fruitworm control, 226, 508.
- fruitworm on beans, Tex. 73.
- fruitworm studies, Ohio 362.
- Fusarium* wilt immunity, white flowers as index, Tex. 59.
- Fusarium* wilt resistance, breeding for, Mo. 59.
- grafted on *Datura stramonium*, interaction between, 175.
- Granville bacterial wilt, susceptibility to, N.C. 485.
- gray-wall studies, 478.
- greenhouse—
 - affected by tobacco mosaic virus strain, 356.
 - experiments, Okla. 193.
 - fertilizers for, Ohio 331.
 - nutrient requirements, Ohio 331.
 - production, new research phases in, 334.
 - single-virus streak disease, U.S.D.A. 843.
- green-wrapped, shoulder bruising in, 334.
- hereditary variegation in, 609.
- insects, control, Tenn. 784.
- juice, ascorbic acid in, effect of processing, Ark. 485.
- juice, *Bacillus thermoacidurans* in, detection, 292.
- leaf mold fungus, new strain, 356, Ohio 344.
- leaf spots, control, Ohio 344.
- leaf spots destructive in Ohio, U.S.D.A. 58.
- leaves, fresh weight and area, correlation, 478.
- Marglobe, yields, effect of Cu sprays, Tex. 59.
- natural crossing in, related to distance and direction, 765.
- nematode resistance test, 765.
- nutritive value, conservation of, Utah 720.
- nutritive value, factors affecting, U.S. D.A. 544.
- parthenocarpy in, induced by β -naphthoxyacetic acid, 49.
- Pennheart, tests, Pa. 628.
- plants—
 - ascorbic acid content and growth, effect of potassium iodide, 193.

Tomato(es)—Continued.

- plants—continued.
 - burning, improved fertilizer drill for prevention, Tex. 60.
 - composition in sand culture, effect of concentrations of added salts, 478.
 - growing on the farm, Mich. 764.
 - healthy, production for northern shipment, U.S.D.A. 627.
 - shipping and bacterial wilt, Ga. Coastal Plain 344.
 - tetraploid, induced by colchicine, 179.
 - young, effect of topping on fruit set and yield, 631.
- plowing under coarse organic matter for, effect, 478.
- production, value of starter solutions in, Pa. 628.
- products, canned, keeping qualities, effect of sulfur residue, 782.
- psyllid, notes, Mont. 655.
- psyllid treatment, avoid residue in, 658.
- resistance to bacterial canker, breeding for, 213.
- resistant to defoliation diseases, breeding for, U.S.D.A. 67.
- ring-spot type of virus disease, 491.
- root knot in greenhouses, "precleanup" control for, R.I. 844.
- roots, excised, gall formation by, 68.
- roots, excised, synthesis of ascorbic acid in, 29.
- roots, isolated, reversible growth inhibition, 28.
- russet mite status, 781.
- seed, first-generation hybrid, production, 49.
- seedless, use of indolebutyric acid in production, Ohio 331.
- seedlings transplanted from sand, control of damping-off, Pa. 647.
- septoriose, control, 648.
- single-virus streak in greenhouse, U.S.D.A. 58.
- spoilage from heat-resistant micro-organisms, 776.
- spotted wilt control, 491.
- spotted wilt, spraying tests with tartar emetic, 776.
- staking and pruning, Ark. 762.
- starter solution experiments, 476.
- stored, weight loss and rot in, effect of nutrient root media on, 478.
- tip blight, Oreg. 641.
- transplants, flea beetle injury to, reduction of, 782.
- treatise, 334.
- varieties for greenhouse culture, development, Ohio 331.
- varieties for Montana, Mont. 628.
- varieties, nematode reactions of, Tex. 59.
- variety tests, Miss. 191, N.Y.State 191.

Tomato(es)—Continued.

- virus tip blight, negative report on, U.S.D.A. 58.
- wheel injury during spraying and dusting, 479.
- whole, home canning, use of calcium chloride in, N.Y.State 129.
- wilt, relation to soil fertility, Miss. 354.
- wilt resistance in, Miss. 208.
- wilt, toxin in, 776.
- yield and quality, effect of irrigation water, 477.

Tonka-beans, culture, P.R. 628.

Torrey, John, biography as story of North American botany, 460.

Torulopsis dactylifera n.sp., description, 358.

Towels and toweling for consumer use, Mo. 573.

Towns, rural, merchandise availability in, 536.

Toxemia in sheep, Mo. 99.

Tractor(s)—

- engine, crankcase dilution and fuel economy, effect of jacket water temperature, 832.
- farm, fuel consumed and work performed, U.S.D.A. 392.
- farm, type, size, age, and life, U.S.D.A. 108.
- fuel waste by operator of, Pa. 688.
- level for laying out contour lines, 689.

Trade—

- agreement, reciprocal, United States-Peruvian, U.S.D.A. 124.
- foreign, of Mozambique, U.S.D.A. 405.

Tradescantia—

- chromosomes, X-ray effects on, N.Y.State 193.
- cytological studies, N.Y.State 193.
- microspores, five-day, chromosomal effects of low X-ray doses on, 746.

Trametes spp. attacking spruce in Great Lakes region, 216.

Transpiration—

- and evaporation, report of committee on, 445.
- rhythmic fluctuations in, under constant environment, 170.

Transportation—

- congressional mandate on, Hoch-Smith Resolution, U.S.D.A. 402.
- efficient, now a necessity, N.Dak. 394.

Tree(s)—

- American, thiamin in, 313.
- coniferous, see Conifer(s).
- effects of November 1940 freeze, Kans. 628.
- for shelterbelt uses, tests, Mont. 628.
- forest, diseases, resistant strains for control, U.S.D.A. 640.
- forest, photosynthesis in, Vt. 483.
- forest, propagation, Mo. 47.
- fruits, new varieties, testing, Kans. 628.
- hardwood—

- British, principal decays of, 781.
- chemical control of sprouts, 57.

Tree(s)—Continued.

hardwood—continued.

- early responses to weedings in, 483.
- stand improvement, relation to diseases in, U.S.D.A. 650.
- injury during November blizzard, relation to hardy rootstocks, Nebr. 47.
- leaves, decomposing, composition, 165.
- mixed hardwood, improvement cuttings in, 56.
- native and exotic, site requirements and growth rate, Mo. 47.
- nurseries, fusiform rust control in, 649.
- of eastern North America, their woodcraft and wildlife uses, 200.
- orchard, viruslike leaf mottling and chlorosis, Oreg. 641.
- propagating methods, Okla. 763.
- propagation by seed, Okla. 194.
- ring(s)—

- analysis, methods of correlation, 317.

- as climatic records, 13.

- formation and interpretation, 170.

- measuring, methods and instruments for, 316.

- studies of pines in Arkansas, 201.

- seed, forest, of North American, 200.

- shade, insects in Maryland, 784.

- shelterbelt, see Shelterbelt.

- spacing, effect on diameter development, Vt. 483.

- troubles during a wet summer, N.J. 213.
- vascular diseases, chemotherapy for, 650.
- Victorian forest, wood decay in, fungi associated with, 497.

Trematodes of subfamily Notocotylinae, life history studies, 230.

Trilacotin v. glucose as nutrient in feeds, 797.

Tribolium—

- castaneum*, see Flour beetle, red.

- confusum*, see Flour beetle, confused.

Trichinosis, U.S.D.A. 98.*Trichodectes ovis* control, Ga. 682.*Trichoderma lignorum* on loblolly pine sapwood, effect, 216.*Trichomonas foetus*—

- bacteria-free strain, isolation and growth, 242.

- differentiating from other protozoa in diagnosis of trichomoniasis in cattle, 682.

- infection in bulls by experimental exposure, 820.

- inoculations with in rats and mice, 364.

Trichomoniasis—

- bovine genital, U.S.D.A. 98.

- bovine, geographical distribution, 527.

- clinical observations in, 244.

- in cattle, diagnosis, differentiating *Trichomonas foetus* from other protozoa in, 682.

- of lower digestive tract of turkeys, 532.

- of upper digestive tract of domesticated birds, 532.

- studies, Kans. 676.

Trichostrongylus—

- calcaratus*, parasite of squirrel, 497.
- colubriformis* in range sheep, phenothiazine-medicated pellets for, 103.
- spp., percentage incidence in cattle, 101.

Trichuris—

- dispar*, anthelmintic efficiency of Ficin against, 247.

- spp., percentage incidence in cattle, 101.

Trillium, cytological studies, N.Y.State 193.**Tripsacum**, *Euchlaena*, and corn, genetic and cytological relations, Tex. 42.**Triasolous murgantiae**, introduction and recovery in California, 499.**Tritona flexa**, bionomics and morphology, 227.**Tropoderma faja** in insect nests, 74.**Trombicula** sp., parasite of squirrel, 498.**Trombiculinae**, larval, descriptions of 12 new species, 372.**Truck crop(s)—**

- boron requirements, N.C. 446.

- growing, relative risks involved, determination, 394.

- in Copiah Co., receipts, expenses, prices, etc., Miss. 536.

- insects studies, Tex. 73.

Truck farmers, better income for, with improved markets, Miss. 269.**Truckee River runoff**, a 100-yr. record, 304.**Trucks**, refrigerator, methyl bromide fumigation of, 783.**Trypsin—**

- activity from -70° to 50° C., kinetics as function of temperature of, 289.

- crystalline, inactivation of, photochemical yield for, 585.

Tryptophan in protein hydrolyzates, new color test for, 730.**Tuberculin** and other diagnostic tests, U.S.D.A. 676.**Tuberculosis—**

- and its eradication, U.S.D.A. 97.

- avian, Michigan plan to combat, 814.

- bovine, eradication in the United States and effects on human health, 814.

- diagnosis, value of blood examinations in, 814.

- eradication, 820.

- eradication, no-visible-lesion case problem in, 814.

- eradication work, efficiency and value of, 814.

- pulmonary, vitamin A and ascorbic acid in, 282.

- report of committee on, 814.

- studies, U.S.D.A., 676.

Tularemia in sheep, role of Rocky Mountain spotted fever tick in, 102.**Tung—**

- buds, effect of chemical treatments in prolonging dormancy, 29.

- iron deficiency in Florida, 484.

- leaves, chlorosis and necrosis of, cause, 649.

- oil meal, solvent-extracted, feeding value for chicks, 236.

Tung—Continued.

- oil, replacement by castor oil, U.S.D.A. 627.

- pollen, storage experiments, 199.

- seed, germination, effect of stratification and planting time, 199.

- seed selection, importance, 767.

tree(s)—

- adaptation studies, Ga.Coastal Plain, 331.

- development of pistillate flower and structure of fruit, 465.

- fertilizer experiments and cultural methods, La. 341.

- fertilizer, variety, and propagation studies, Miss. 331.

- foliage poisoning of cattle, 100, Fla. 526.

- phosphorus compared with other fertilizers for, 627.

Turf—

- diseases, control, R.I. 344.

- diseases, control, mercury substitutes for, N.J. 62.

- fungicide, new, named Thiosan, 206.

Turkey(s)—

- breeders, management, N.J. 806.

- breeding and cross-breeding studies, N.C. 468.

- breeds, comparison, 378.

- Bronze, gains in weight made by male and female, 806.

- cross-breeding and heterosis in, 37.

- disease, choleralike, Mich. 248.

- eggs, hatchability, and riboflavin, Pa. 667.

- eggs, length of incubation period, effect of age and weight, 519.

- eradication of paratyphoid disease in by sanitation, N.C. 532.

- feathers, fertilizing value, Oreg. 595.

- feeding and confinement rearing experiment, Mich. 670.

- growing under semiconfined conditions, Tex. 85.

- growth of tarsometatarsus, relative, 613.

- leg bone deformities, 519.

- marketing, Tex. 110.

- of different breeds, composition, 377.

- pH of digestive tracts of, 236.

- physical and chemical composition, 700.

- poult—
calcium and phosphorus requirements, Tex. 85.

- finishing, rations for, Tex. 85.

- hatching, separate incubators for, Pa. 667.

- infectious omphalitis of and impetigo staphylogenes in man, 105.

- nutrition, significance of blotin in, 376.

- protein needs, Tex. 85.

- protein utilization from various sources by, Nebr. 84.

- vitamin D requirement, U.S.D.A. 665.

- production, lights in, Pa. 667.

Turkey(s)—Continued.

- production, rations and breeding for, Kans. 666.
- protein supplements for, comparison, Mo. 84.
- range v. cut green feeds for, Pa. 667.
- rations, alfalfa meal in, Utah 670.
- respiratory diseases, U.S.D.A. 98.
- respiratory-nervous disorder in, 826.
- riboflavin requirement for hatchability and growth, 376.
- short spined, skeletal abnormalities, 183.
- storage of vitamin A by, 89.
- strain differences in, Tex. 35.
- wild, food habit trends in Missouri, 361.
- young, detecting salmonellosis in, 105.

Turnera to *Ungnadia*, host-parasite check-list revision, U.S.D.A. 343.

Turnip(s)—

- aphid studies, Tex. 73.
- greens, ascorbic acid in, factors affecting, Ga. 699.
- growth, effect of natural fertilizer materials, 185.

Turpentine—

- products from, U.S.D.A. 723.
- separating into components, U.S.D.A. 723.

Tuskegee Institute notes, 427.

Twig girdler, pest of hickory, 219.

Tyrocycline—

- d*-amino acids in, 583.
- effect on bacteria, 457.
- in vitro and in vivo studies, 815.

Tyrosine, metabolism, role of ascorbic acid in, 419.

Tyrosine, in vitro and in vivo studies, 815.

Udder—

- of cow, development, structure, and physiological functioning, Minn. 380.
- streptococci of dairy cows, effect of sulfanilamide on, Mo. 99.

Ultracentrifugation results, computation, alignment chart for, 346.

Ultraviolet—

- irradiation, elimination of contaminants with, 208.
- radiation, bactericidal action on air-borne organisms, 26.

Undulant fever studies, 814.

United States Department of Agriculture—

- Bureau of Agricultural Economics, *see* Bureau of Agricultural Economics.
- Bureau of Dairy Industry, *see* Bureau of Dairy Industry.
- Bureau of Entomology and Plant Quarantine, *see* Bureau of Entomology and Plant Quarantine.
- list of available publications, 142.
- slides, catalog and price, U.S.D.A. 699.

Urea—

- as protein substitute in ration of ruminants, 231.
- as soil disinfectant, U.S.D.A. 640.

Urea—Continued.

hydrolysis in soils, enzymatic v. microbial concepts, 598.

in chick rations, Okla. 797.

utilization by ruminants, effect of starch in ration, 667.

utilization by young calves, 90.

Uredinales, taxonomic study, 642.

Uric acid excretion of young children, effect of diet, 410.

Urinary—

calculi in sheep, 389.

17-ketosteroids, neutral, colorimetric assay, elimination of errors in, 589.

tract in small animals, effect of sulfonamides on, 818.

Urine—

ascorbic acid determination in, 153.

extraction of lactogen from, Mo. 34.

of pyridoxin-deficient rats, green pigment-producing compound in, 727.

riboflavin in, fluorimetric estimation, 591.

Urocystis tritici, physiologic races in, 772.

Uromyces striatus, notes, 487.

Utah College notes, 429, 575.

Utah Station notes, 429, 575.

Vaccinium—

host-parasite check-list revision, U.S.D.A. 640.

species, cytology, 467.

Vanilla—

beans, processing and chemical changes involved in flavor development, P.R. 579.

culture, pollination, and breeding, P.R. 628.

curing, 442.

plantings, injury by snail and slug, P.R. 636.

Variation, coefficients of, limitations to use of, 693.

Veal, dressed, market classes and grades, U.S.D.A. 269.

Vegetable(s)—

and fruit dehydrator, Nebr. 105.

areas in Florida, production credit, Fla. 119.

ascorbic acid in, factors in processing affecting, 713.

canning crops, quality studies, N.Y.State 272.

canning methods, Calif. 409.

culture tests, R.I. 331.

culture, value of lime in, Ark. 762.

curly top resistance in, Oreg. 641.

damping-off, control, effect of nitrogen, Mass. 65.

dehydrated—

nutritive value and palatability, N.Y.State 272.

packaging, N.Y.State 157.

rapidly refreshing, 11.

dehydration—

adequacy of blanching process in, 440.

Vegetable(s)—Continued.

dehydration—continued.

by farmers' cooperative associations,
U.S.D.A. 404.

past and present, 440.

studies, 157, 158, 440, N.Y.State 287.
tests, 295.

desirable, for fall planting, Miss. 191.

diseases—

bordeaux and fixed copper sprays or
dusts for, Ohio 344.

effect of weather, N.J. 490.

in Massachusetts, U. S. D. A. 58.

in Nebraska, 490.

in New Jersey, effect of weather,
U.S.D.A. 640.

on Chicago market in 1940-41,
U.S.D.A. 343.

studies, Kans. 640.

dried, made into bricks freed from air
in new packaging process, N.Y.State
850.

early, fertilizers for, Ohio 331.

effect of boron on, Oreg. 628.

fertilizer placement, Ark. 762.

fertilizer tests, Miss. 331.

fertilizers for, Okla. 763.

freezing preservation, 848, N.Y.State 272,
U.S.D.A. 723.

freezing procedures, 272.

fresh and canned, quality, relation to
retail prices, Ohio 304.

fresh, selling cooperatively, U.S.D.A. 404.

frozen, determining maturity of, 150.

gardens, early, time for plowing and
preparing soil for, Miss. 629.

growth and production, effect of lime on,
Ark. 46.

home canning U.S.D.A. 129.

home drying, U.S.D.A. 130.

insect studies, N.Y.State 218.

irrigation, Ark 762, Okla. 763.

irrigation and mulching, Nebr. 47.

juices—

expressed, vitamin C, carotene, cal-
cium, and phosphorus in, 559.

home preparation and preservation
N.Y.State 129.

loss of flavor and of food value in
preparation, 155.

making in small lots, N.Y.State 274.

preparation and preservation, N.Y.
State 149.

special problems in preparation,
N.Y.State 274.

leafy, nutritive value, Miss. 544.

marketing, Kans. 693.

mineral composition in representative re-
gions, relation to nutritive value, Tex.
127.

nutrient constituents per acre and per
acre man-hour, 546, 855.

nutrition of, Mo. 46.

of New York State, vitamin C in, N.Y.
State 284.

oils, *see* Oil(s), vegetable.

Vegetable(s)—Continued.

phosphorus and calcium in, distribution,
133.

possibility of overirrigating, Pa. 628.

preparing for frozen food lockers, 700.

quality and nutritive value, effect of
various cooking methods, 847.

refuse, insect pests breeding in, 72.

relation of glutamine and asparagine in,
R.I. 331.

relation of percentage of margin to sales
and attractiveness of display to sales,
Ohio 394.

riboflavin determination in, 437.

seed production in Utah, possibilities,
Utah 191.

seed treatment recommendations, R.I.
344.

seed treatment studies, 484.

selection for dehydration value, N.Y.
State 101.

southern grown, composition, Ga. 699.

storage, Ga. 627.

storage as help in wartime, Colo. 763.

studies with, Tex. 47.

thiamin determination in, 438.

use of commercial fertilizers for, Mont.
628.

use of overhead irrigation on, Ga. 627.

value of stable manure for, Ark. 763.

varieties for irrigated central Washing-
ton, 191.

varieties, new, tests, Okla. 763.

variety tests, Ga.Coastal Plain 331, Kans.
628, Miss. 331, Nebr. 47, Oreg. 628,
Pa. 628, R.I. 331.

vitamin content, N.Y.State 272.

wartime marketing problems of, Ark.
841.

wastes, utilization, U.S.D.A. 723.

weevil studies, Tex. 73.

Vegetation—*see also* Flora(s) and Plant(s).

and forest wealth of Ecuador, 169.

and natural resources of British Hon-
duras, 169.

of Jamaica, 169.

of Trumbull County, Ohio 601.

use of water by, 298.

yield and quality, relation to sunlight,
Tex. 42.

Velvet grass, creeping, control, Oreg. 619.

Velvetbean(s)—

caterpillar, biology and control, La. 362.
variety tests, Ga.Coastal Plain 325.

Verbena, new pest of, 362.

Vermont Station notes, 143, 430.

Vermont Station report, 574.

Vermont University notes, 143.

Veronica braunii, injury to vanilla plant-
ings, P.R. 656.

Verticillium—

diseases, new records for, U.S.D.A. 58.

matthusei in mushroom soil, control
with chloropicrin, 355.

wilt of chrysanthemum, control, Ohio
344.

Vetch—

- bruchid in Georgia, 499.
- culture, drainage highly important factor, Miss. 186.
- diseases, Ga. 640.
- fertilizer tests, Ga. 617, Miss. 159.
- for green manure, Utah 186.
- growth, comparison of phosphates for, Miss. 186.
- hairly, as green manure crop for cotton, 185.
- hairly, fertilizer tests, Miss. 325.
- hairly, most profitable fertilizers for, Miss. 325.
- hairly, yield increased from lime and phosphate, Miss. 618.
- moderate use of phosphate and lime for, Miss. 186.
- planting for seed production, 185.
- superior varieties or strains grown by station, Oreg. 619.
- variety tests, Tex. 42.

Veterinary—*see also* Animal diseases.
surgery notes, 383.

Viburnum to *Vitis*, host-parasite check-list revision, U.S.D.A. 640.

Viola—

- faba*, histological responses to indoleacetic acid, 742.
- sativa*, karyological races, 180.

Vine weevil, black, control, 72.

Violet(s)—

- genetic studies, Vt. 467.
- scab, additional records, 779.

Virus(es)—

- bacterial, inactivated and active, interference between, 769.
- bacterial, interference between, and mechanism of virus growth, 769.
- diseases and respiration, 769.
- diseases of plants and animals, treatise, 485.
- diseases of yellows type, spread under field conditions, 61.
- in primordial meristem, 205.
- nature of, recent evidence regarding, 846.
- nomenclature and classification, 205.
- Nomenclature and Committees, comment on paper, 346.
- research, review, 485.

Visual mechanisms, symposium, 130.

Vitamin A—

absorption—

- and retention by hens on normal and low fat rations, 803.
- experiments, 135.
- metabolism, and storage, 413.
- and carotene, utilization in rat, 551.
- and dark adaptation, effect of alcohol, benzedrine, and vitamin C, 552.
- and visual systems, 130.
- chemistry and physiological activity, 413.
- deficiency (ies)—
 - and nervous system, 136.
 - criteria, 282.

Vitamin A—Continued.

deficiency (ies)—continued.

- damage to reproductive organs from, Ohio 380.
- diagnosing, simple methods, 413.
- effect on reproduction in farm animals, Ohio 318.
- in cattle and cystic pituitary, 375.
- in cattle, effect on reproductive functions and dilution and quality of semen, U.S.D.A. 670.
- in rat, early signs, relation to liver stores, 708.
- dietary levels, relation to dark adaptation of children, 709.
- distribution, changes in choline deficiency, 413.
- effect on immunological reactions in man, 551.
- excess stores, fate during depletion, 708.
- in blood, relation to body reserves, 135.
- in blood, relation to dark adaptation, 552.
- in liver of rat, state of, 707.
- in milk, effect of shark-liver oil in feed, 673.
- in milk, relation to pasture and feeding practices, seasonal variation, 807.
- in pickles from different areas, 295.
- in pig feeding, 234.
- in prepared foods, 281.
- in shad and mackerel oils, 708.
- in various solvents, ultraviolet absorption, 8.
- in willow oak acorns, effect in chick diet, 803.
- intake, education as means of improving, Pa. 701.
- metabolism of human subjects, R.I. 409.
- mobilization by alcohols from its stores in tissues, 855.
- of liver biopsy specimens and plasma vitamin A in man, comparison, 706.
- potency of liver, relation to chemical analyses, 731.
- potency of milk and shark-liver oil, 807.
- prairie hay as source of, Okla. 808.
- requirements—
 - for conception in dairy cattle, Tex. 92.
 - for fattening beef cattle, Tex. 85.
 - of beef cattle and sheep, Tex. 85.
 - of cattle, sheep, and swine, 798.
 - of dairy cattle, 807.
 - of pigs, Tex. 85.
 - of rat, intake relation to growth and concentration in retina, 707.
- rich milk, producing, Ind. 809.
- storage by growing turkeys, 89.
- storage in liver of rats, Pa. 701.
- studies with rats and pigs, 234.
- ultraviolet absorption maximum of, effect of solvent, 590.
- utilization, effect of fat level in diet, 553.
- value of fresh and dehydrated carrots, 281.

- Vitamin B₁**—*see also* Thiamin.
 and endurance, 709.
 bibliography supplement, 414.
 clinical aspects, 705.
 deficiency diets in rats, studies of gastrointestinal tract, 139.
 determination, by yeast fermentation method, 293.
 determination, spectrophotometric accuracy, 293.
 effect on concentration of glucose optimal for fungi fruiting, 602.
 effect on crops of North Carolina soils, 619.
 in Indian foods, 709.
 in yeast and bread and stability during bread making, 292.
 loss on baking, 151.
 royal jelly and bee bread as source, 82.
 stability in manufacture of bread, 837.
 studies, Tex. 599.
 synthesis by yeast, 555.
- Vitamin B₂**—
 loss from yeast during dissimilation, 742.
 royal jelly and bee bread as source, 82.
- Vitamin B₆**—*see also* Pyridoxin.
 effect on egg production and hatchability, 804.
 in nutrition of pig, 516.
 royal jelly and bee bread as source, 82.
- Vitamin B complex**—
 and fat metabolism, 136.
 deficiency, effect on gastric emptying and intestinal motility, 136.
 deficiency in young pigs, sensory neuron degeneration in, control, 799.
 experimental deficiency, mental changes in, 554.
 for swine, deficiencies, U.S.D.A. 665.
 in beers, ales, and malt tonics, 856.
 in nutrition of dogs, 87.
 meat as source, 281.
 requirements for lactation, Ark. 284.
- Vitamin C**—*see also* Ascorbic acid.
 administration in a large institution, effect on general health and resistance to infection, 419.
 and wound healing, 563.
 determination, color reaction for dehydroascorbic acid useful in, 9.
 effect on immunological reactions in man, 551.
 for sterility in farm animals, 35.
 in cabbage, 627.
 in dairy cattle nutrition, 90.
 in guavas, 714.
 in guavas, fresh, canned, and dried, 418.
 in muskmelons, Ohio 409.
 in New York State vegetables, N.Y.State 284.
 in normal nutrition, 714.
 in persimmon leaves and fruits, 313.
 in pickles from different areas, 295.
 in rose hips, 714.
 in snap beans, 627.
- Vitamin C**—Continued.
 in strawberries, determination, variations in samples, 713.
 in strawberries, sun-ripened v. shade-ripened, N.C. 476.
 loss from turnip greens, effect of storing and cooking, Miss. 409.
 loss in making evaporated milk, Pa. 671.
 loss in milk prevented by cold temperature, Ohio 380.
 nutritional status of human subjects, R.I. 409.
 royal jelly and bee bread as source, 82.
- Vitamin D**—
 assay, A. O. A. C., 377.
 assay, importance of using "litter-mate" comparisons, 284.
 assay technic with radioactive strontium, 438.
 deficiency of dairy cattle, 566.
 determination, A. O. A. C. chick method, use of toes rather than tibiae in, 735.
 from different sources, effect on bone ash curve, 377.
 from soft curd and homogenized milk, effectiveness on rickets, Ohio 380.
 in milk, Ohio 380.
 in milk, control and verification of, 91.
 in milk, effect of irradiation of cows, Ohio 380.
 in shad and mackerel oils, 706.
 in shark-liver oil, 798.
 massive doses, prevention of dental caries by, 569.
 parathyroid glands, and calcium metabolism, 91.
 requirement of turkey poults, U.S.D.A. 665.
 requirements of White Leghorn chicks v. crossbreds, 518.
 single massive doses, feeding to birds, 377.
 stability, 89, 377.
- Vitamin E**—*see also* Tocopherol.
 assay tests, 564.
 distribution in rat tissues, 561.
 in grain milling products and effect of bleaching on, 715.
 role in prevention of sterility, 472.
- Vitamin G**, *see* Riboflavin.
- Vitamin H**, biotin, and coenzyme R, review of literature, 863.
- Vitamin K**—
 determination, colorimetric method, 593.
 papers on, 705.
- Vitamin P** deficiency, experimental, 420.
- Vitamin(s)**—
 advances in knowledge of, 854.
 and micro-organisms, 413.
 antihemorrhagic, *see* Vitamin K.
 antineuritic, *see* Vitamin B₁.
 antirachitic, *see* Vitamin D.
 as growth substances for plants, 25.
 biological action, symposium, 705.
 chemistry and physiology, 281.
 deficiency, clinical, chemical measurement and control, 706.

Vitamin (s)—Continued.

- deficiency diseases, 565.
- for livestock, Mo. 514.
- in food, relation to human nutrition, Kans. 701.
- in fungi, 705.
- in grasses of Nebraska, Nebr. 84.
- in mixtures, proper use of, 705.
- nature and function, 295.
- requirement of rat, effect of exercise, Pa. 701.
- social implications, 134.
- studies, Mo. 134.
- synthesis by a yeast converted from heterotrophic to autotrophic habit, 28.
- varying amounts in the diet, effect on animal body, Kans. 701.
- Walls, rammed earth, soil admixtures for, 253
- War and farm work, U.S.D.A. 111.
- War program, role of insecticides and disinfectants in, 657.
- Washing compounds, alkaline, germicidal properties evaluation, 243.
- Washington College notes, 575.
- Washington Station notes, 575, 722
- Wasp, New Calendonian cockroach, biological notes, 74.
- Wasps nests as reservoirs and sources of stored products pests, 73.
- Wasps, wood, siricid, and symbiosis, 654.
- Waste materials, nitrogen content, N.J. 738.
- Water—
 - absorption at low soil temperatures, species differences, 743.
 - and soil conservation studies, Tex. 15.
 - and soil losses under different conditions, N.Y.State 160.
 - and soil losses under different cropping methods, Ark. 15.
 - attack on dry cohesive soil systems, mechanism of, 450.
 - bearing materials, permeability determination methods, 106.
 - conservation, effect of lining irrigation canals, Utah 595.
 - entry into roots, device for measuring, 463.
 - evaporation and consumptive use, empirical formulas for estimating, 449.
 - ground, areas in Southwest, classes of, present and future use, 448.
 - ground, control and conservation, relation to food production, U.S.D.A. 827.
 - heater, solar, P.R. 692.
 - heaters, plug-in, Pa. 688.
 - irrigation, *see* Irrigation water.
 - levels and artesian pressure in observation wells, 106.
 - management, relation to grassland farming, 107.
 - movement through soils, relation to pores, 17.
 - pipes, protection against freezing by heating cable, Pa. 688.
 - resources of Willamette Valley, Oregon, 828.

Water—Continued.

- stage recorder charts, determining volume of runoff from, 252.
- supply (ies)—
 - in Georgia, public, industrial quality, 688.
 - of Dakota sandstone in Ellendale-Jamestown area, 828.
 - of Hawaii, 392.
 - of United States, 106, 392.
 - of United States, Ohio River Basin, 828.
 - public, removal of fluorides from, 532.
- Waterfowl in British Columbia, studies, 360.
- Water-hyacinth leaf spot disease, cause, 781.
- Watermelon (s)—
 - cultural tests, Ga.Coastal Plain 331.
 - fertilizer tests, Ga.Coastal Plain 331.
 - Fusarium* wilt resistance, tests for, Tex. 60.
 - growing district, serious damage by *Fusarium* wilt in, 203.
 - wilt resistance and acetic acid, 491.
 - wilt resistance, breeding for, Ga. 627.
 - wilt-resistant strains, Miss. 203.
- Watershed (s)—
 - at West Tarkio Creek and Tarkio River, hydrologic studies, U.S.D.A. 158.
 - North Appalachian Experimental, at Coshocton, Ohio, U.S.D.A. 594.
- Waterways, vegetated, tests on, Okla. 164
- Waxy coatings on cucurbit fruit, study of permeability to respiratory gases, 607.
- Weasel, short-tailed, winter food habits, 360.
- Weather—*see also* Meteorological observations and Meteorology.
 - astronomy, and maps, treatise, 298.
 - effect on vegetable diseases, N.J. 490.
 - forecasting, basic principles, 735
 - of Scotland in 1941, 446.
 - studies, R.I. 290.
- Webworms, control, R.I. 362.
- Weed (s)—
 - control, Miss. 186.
 - control on closely cut turf and on fairways, R.I. 326.
 - non-noxious, for green manure, Utah 186.
 - pasture, control, Tex. 42.
 - seeds, killing with chloropicrin, Ohio 826.
- Weevils, protection of corn from, Miss. 499.
- Weights and measures in United States, inspection and control, U.S.D.A. 401.
- Well water as milk-cooling medium, Pa. 671.
- Wells, observation, water levels and artesian pressure in, 106.
- West Virginia Station notes, 722.
- West Virginia University notes, 722.
- Wethers, ground Love grass hay for, Okla. 797.
- Wetting agents, properties and applications, 520.
- Whale and fish meal, nutritive value, 231.
- Whale meat meal in chick ration, 878.

Wheat—

agreement, international, U.S.D.A. 124, 405.
 agreement, "New World," U.S.D.A. 123.
 and wheat products, nicotinic acid, pantothenic acid, and pyridoxin in, 557.
 as livestock feed, Utah 687.
 auxin extraction from, 462.
 average acre yields and production costs, Alaska 617.
 basin, ordinary, and contour listing for, Kans. 618.
 bin fumigation tests, Okla. 756.
 bins, fumigating, safer methods, Okla. 783.
 breeding, Alaska 617, Ga. 617, Kans. 618, Mo. 41, Mont. 618, Nebr. 41, Okla. 755, Oreg. 619, Tex. 42, U.S.D.A. 616.
 brown necrosis and *Alternaria* blotch, 348.
 bunt, *see* Wheat smut, stinking.
 Canadian hard red, thiamin in, variability, 415.
 carbohydrate metabolism under deficient moisture, 81.
 cold resistance, factors affecting, Nebr. 41.
 Comanche and Pawnee, new hard red winter, high-yielding and leaf rust resistant, U.S.D.A. 616.
 combining, proper stages for, Pa. 619.
 composition, factors affecting, 21.
 conditioning requirements, and their effect on milling and baking, Kans. 579.
 culture, continuous v. rotation, N.Dak. 330.
 culture tests, Ga. Coastal Plain 325, Kans. 618, Mont. 619, Tex. 42.
 disease resistance in, breeding for, Kans. 640.
 dusted, viability after storage, 206.
 estimating reduction in yield from hessian fly infestation, U.S.D.A. 794.
 eyespot in Great Britain, cause, 772.
 Fairfield, description, Ind. 762.
 fertilizer tests, Ga. 617, Kans. 618.
 field survey, Ohio 370.
 flour, *see* Flour.
 germination and baking quality, effect of carbon disulfide, Okla. 190.
 grading and protein tests of grain inspection laboratory, Mont. 619.
 growth and yield, relation to environment, Kans. 618.
 hard red winter, quality characteristics, U.S.D.A. 625.
 hybrids, inheritance and interrelation of components of quality, cold resistance, and morphological characters in, 608.
 in national diets, 128.
 inoculation tests with *Helminthosporium sativum*, antagonism in, 349.
 Kansas, quality, effect of ICl_3 , ethylene gas, and Cl on, Kans. 579.
 leaf rust damage, forecasting, Okla. 769.

Wheat—Continued.

leaf rust, physiologic races, revision, U.S.D.A. 207.
 loose smut control, Okla. 769.
 milling products, vitamin E in, and effect of bleaching, 715.
 mite, brown, covering stubble for control, Okla. 783.
 mosaic virus, heat inactivation in soils, 207.
 North Dakota, quality in 1942, N.Dak. 626.
 nutrients in, effect of soil fertility, Ind. 737.
 Oklahoma, quality improvement, Okla. 755.
 physical properties, factors affecting, Kans. 579.
 phytic acid distribution in, 289.
 Pilot and Rival, resistant to leaf rust, expansion of areas, U.S.D.A. 616.
 plant characters, relation to yield, effect of tillage and sequence treatments, 762.
 planting tests, Nebr. 41.
 polley, wartime, in Canada, 693.
 polyploidy studies, Mo. 41.
 quality, chemical factors affecting, Kans. 579.
 quality during storage, factors affecting, Kans. 688.
 quality, effect of unfavorable weather at harvest, N.Dak. 298.
 quality, inheritance studies of factors affecting, Kans. 618.
 respiration, fermentation, and growth, effect of oxygen tension, 745.
 response to fallow and other tillage practices, Nebr. 41.
 root strength, guide to winter hardiness, Ohio 326.
 rust-resistant, development, N.C. 473.
 rust-resistant variety, new, Utah, 620.
 scab absent in western North Dakota, U.S.D.A. 58.
 scab control, U.S.D.A. 349.
 scab in Virginia, U.S.D.A. 58.
 smut, stinking, control, Mont. 641.
 smut, stinking, in Rumania, distribution, 772.
 smut, stinking, inoculation method for, Nebr. 59.
 species, role of interspecific hybridization in origin and production of new forms, 466.
 spring, drought resistance in, 169.
 spring, heat, light, and drought tolerance in, Kans. 618.
 stabilization in Australia, U.S.D.A. 124.
 stem rust, physiologic races in Portugal, 207.
 stem rust resistant varieties, new, and genetical background, 642.
 superior varieties or strains grown by station, Oreg. 619.

Wheat—Continued

surplus, conversion into much needed milk, Utah 673.

take-all disease, control, U.S.D.A. 347.

tillage experiments and rotations, Oreg. 619.

use in livestock feeding, Wyo. 373.

varieties, Miss. 41.

varieties grown in West, quality studies, U.S.D.A. 626.

variety tests, Ark. 755, Ga. 617,

Ga. Coastal Plain 325, Kans. 618, Miss. 325, Mont. 618, Nebr. 41, Okla. 755, Tex. 42.

wind erosion, relation to different types of tillage preparation, Tex. 42.

winter, as supplement to native grass for pasture, Kans. 618.

winter, leaf and stem rust races, combined resistance to, Kans. 640.

winter, physiological study, Kans. 603.

world survey and outlook, 270.

yield and milling and baking quality, effect of fertilizers, Okla. 756.

yield and mineral content, effect of minor element compounds, 456.

yields, crop rotation v. superphosphate for, Ark. 755.

Wheatgrass—

crested—

culture tests, Mont. 619.

Fairway, sowing with alfalfa to keep out "cheat" grass, Oreg. 619.

feeding tests for steers, Mont. 666.

for wintering steers, Mont. 667.

grazing studies, Mont. 619.

superiority in pasture experiments, U.S.D.A. 617.

uses, Mont. 619.

new tetraploid, from Nevada, 317.

Whey solubles as source of growth factors in chick rations, 376.

White ants, *see* Termite(s).

White grubs—

biology, control, and taxonomy, Tex. 73.

control, Conn. [New Haven] 499.

control with dichloroethyl ether, 78.

in forest nurseries of Southeast, tests of chemicals for control, 227.

on wheat, Kans. 655.

White pine—

blister rust—

control, Ohio 344.

control in Northwest, developments, 216.

control in Washington State, 496.

control policies in New York State, 496.

spread in 1941, 651.

forests, western, economic management, U.S.D.A. 55.

piles, creosote treatment, 254.

sapwood and compression wood, polyuronide hemicelluloses isolated from, 584.

White pine—Continued.

seedlings in soils of low fertility, my-

corhizal inoculation of, 56.

species, analysis of wood, 465.

wolf trees, profits from cutting, 201.

Whitebrush poisoning in horses, 103.

Whitedish meal, nutritive value, 231.

Whitefly, redbud, studies, Kans. 655.

White-fringed beetle(s)—

fumigation of small land areas for control, 791.

new species, 367.

Wild rice, vitamins in, 857.

Wildlife—

as valuable resource, Pa. 652.

cover, northeastern forest, plant pathology in relation to, 359.

diseases and parasites, U.S.D.A. 90.

Forest Station, Huntington, history, policy, and program, 217.

production handbook, U.S.D.A. 497.

Willow blight in West Virginia, 497.

Windbreaks, *see* Shelterbelt.

Winds, velocity and direction, 299.

Wine—

control program in Argentina, U.S.D.A. 696.

sulfur dioxide in, effect of storage, 442.

Wire and fencing, atmospheric exposure, Tex. 106.

Wireworm(s)—

control, 654, Pa. 652.

control, progress in, N.Dak. 659.

eastern field, control on shade-grown tobacco, 782.

on wheat, Kans. 655.

organic fumigants for, tests, 504.

Pacific coast, value of trapping males and parthenogenicity of females, 78.

populations, effect of sunflowers, Ohio 362.

rate of development, effect of sterile and unsterile foods, 361.

sand, La. 362.

seasonal vertical distribution in soil relation to control, 77.

studies, 367, Ohio 362.

sugar beet, dichloroethyl ether for control, 790.

Witches'-broom disease, susceptibility of selections of cacao to, 494.

Wohlfahrtia meigeni, notes, Mont. 655.

Women, college—

Ca, P, and N metabolism, 852.

calorie intakes, 275.

nutritional status, Kans. 701.

Wood—*see also* Lumber and Timber.

decay susceptibility, effect of urea and other nitrogen compounds, 651.

decayed, caloric value and chemical composition, 652.

fuel in wartime, U.S.D.A. 57.

preservation, availability of materials for in 1942, 254.

preservatives, products of Disco-type low-temperature coal tar as, 254.

Wood-- Continued.

- preserved, use in home construction, 254.
- treated, and preservatives used in U. S. in 1941, quantity, 255.
- treated, chromates and arsenates in, determination, 154.

Wood-borers, notes, 654.**Woodcock populations, breeding, 398.****Woodland(s)--**

- place in farm organization, N.H. 263.
- southern, preventing destructive fires in, U.S.D.A. 768.

Woody plants--

- identification, tabular keys, 309.
- in Idaho, recently active leaf diseases, U.S.D.A. 202.
- leafy cuttings of, treatment with synthetic growth substances, Ohio 46.

Woody stems, movement of auxin in, 742.**Wool--**

- blended fabrics, how to sell and care for, 865.
- elasticity, relation to chemical structure, 571.
- fibers, density, determination, cross-section-area method, U.S.D.A. 140.
- in mixed fabrics, quantitative determination methods, 421.
- of different breeds, shrinkage, U.S.D.A. 685.
- of Texas, size of sample and determination of grades and shrinkage, Tex. 85.
- powdered, nutritional studies, 545.
- production, Merino, studies, 668.
- quality and fiber diameter, relation, 421.
- quantitative estimation, comparison of methods, 140.
- resistance to digestion by enzymes, cause, 421.
- shrinkage, Mont. 666.
- yield, relation to staple length, U.S.D.A. 665.

Woolly aphid, see Apple aphid, woolly.**Worms, parasitic, seasonal incidence, role of soil temperatures and soil moisture, 531.****Wound healing--**

- and vitamin C, 563.
- review, 677.

Wren, rock, insect food, 217.**Wyoming Station notes, 576, 869.****Wyoming University notes, 576.*****Xanthopastis timais*, biology, 654.*****Xenopsylla cheopis*, see Rat flea, oriental.****Xerothermic theory, 443.****X-ray seed treatments, auxin and callines in seedlings from, 743.****Yeast(s)--**

- budding and conjugation in, mechanics, 601.
- debuterized brewers', for enrichment of white bread, 555.
- growth-promoting effect of diaminocarboxylic acid from biotin, 711.
- new acetifying, 740.
- osmophilic, nutritive requirements, 460.
- respiration, stimulation by ultraviolet radiations, 33.
- sporulation stock medium for, 310.
- sugar-tolerant, cause of souring of dried dates, 11.
- vitamin B₁ in, and stability during bread making, 292.

Yellow scale--

- and its parasite, effect of tartar emetic on, 77.
- fumigation with HCN, 789.

Yerba maté, U.S.D.A. 124.**Yew crown gall, 359.****Youngberries, preservation with sulfurous acid, Ga. 700.****Youth problems, analysis, Colo. 698.****Zein--**

- hydrolysis, optical rotation of sulfuric acid hydrolyzates of, factors affecting, 582.
- hydrolyzates prepared by autoclaving, threonine deficiency in, 581.
- in concentrated ethyl alcohol, critical peptization temperatures, 724.

Zecurine stratumatrica*, mycorrhizal associate of, 27.*Zinc--**

- in animal and plant nutrition, 456.
- oxide, new larvicide for hornfly control on cattle, 227.
- relations in Utah soils, 599.
- substitutes in fungicidal sprays, 206.

Zonosemata electa*, studies, Ga. 655.**Zygosaccharomyces--***

- acidifaciens* n.sp. in domestic red wine turning sour, 740.
- nutrillite requirements, 460.
- on dates, 358.

NEW DELHI.

[illegible]